SignWriting (SW) of Maltese Sign Language (LSM) and its development into an orthography: Linguistic considerations

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DECLARATION

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PhD Dissertation Linguistics

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I hereby declare that I am the legitimate author of this dissertation and that it is my original work. No portion of this work has been submitted in support of an application for another degree or qualification of this or any other university or institution of learning.

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ABSTRACT

This study investigates the use of the Valerie Sutton SignWriting (SW) system, a non-linear featural writing system for the writing of LSM (Maltese Sign Language). Every SW glyph represents a feature and at times a phone of sign language (SL) articulation. Hence SW may be used to write any sign language. Available LSM SW texts were analysed and a number of reading difficulties were identified. These included LSM pointing signs in the LSM SW texts which were highly ambiguous and their representation in written form caused difficulty in reading the texts.

The analysis of the reading difficulties led to the linguistic study of LSM pronouns and agreement verbs and to a consideration of how SW may be used to represent the grammatical level of LSM, rather than just the phonetic level of LSM.

One main conclusion of the study was that marking LSM grammatical space in written form helps to disambiguate between LSM pronouns from other pointing signs in LSM and provides a 'key' to readable forms of all LSM signs related to pronominal affixing.

This work also offers a description of LSM whole entity classifier verbs and handle classifier verbs and their representation in written form. LSM handshape and movement graphemes are suggested where the grapheme is indicative of corresponding LSM phonemes. Recommendations for a reduction in the number of glyphs used to write LSM is included and a manual for the teaching of the SW of LSM is also proposed.

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In the sweet memory of papa' and nannu Joe Galea (1944-2013).

May the sound of your beautiful laughter, that we miss so much, now be heard in Heaven.

ACRONYMS USED

SL	Sign Language
SW	SignWriting
LSM [1]	Lingwa tas-Sinjali Maltija. (Maltese Sign Language)
WE classifier	Whole Entity Classifier
CL-	Classifier
ASL	American Sign Language
BSL	British Sign Language
LSQ	Quebec Sign Language
Auslan	Australian Sign Language
LS	Langue de Signes (sign language)
IPA	International Phonetic Alphabet
LIBRAS	Brazilian Sign Language
LSE	Lengua de Signos Española (Spanish Sign Language)
ABSL	Al-Sayyid Bedouin Sign Language
ISL	Israeli Sign language
LSC	Catalan Sign Language

[1]LSM is the acronym that has been adopted for Maltese Sign Language since the 1990s. It also happens to be the acronym used for Mexican Sign Language (LSM) (cf. Quinto-Pozos, 2008). In this work LSM refers only to Maltese Sign Language. When any reference is made to Mexican Sign Language the name of this sign language is given in full.

LIS	Italian Sign Language
LSF	Langue de Signes Française (French Sign Language)
DGS	German Sign Language
LMAP	Literature Malta Archive Puddle
UoM	University of Malta

CONVENTIONS USED

C.A.P. S (with full-stops)	Fingerspelling e.g. P. A. R. I. S
CAPS	Glosses in Maltese e.g. GĦADA
Brackets (CAPS)	Glosses in English e.g. (TOMORROW)
Brackets <>	Representation of graphemes
Brackets [ ]	Representation of phones
Brackets / /	Representation of phonemes
Italics	Title of books

Also, the Maltese gloss for verbs is always presented in the 3rd person masculine perfect inflection, i.e. QAM, TELAQ etc.

GLOSSARY

SignWriting (SW): SW is the general writing system invented by Valerie Sutton that consists of 652 BaseSymbol glyphs of the ISWA 2010 (International SignWriting Alphabet). When used to write any sign language (SL) from its complete list of symbols of the ISWA, it is best described as a featural system. When applied to the writing of a specific language, with decisions taken by users of the system regarding the phonemic level of the language it may best described as an alphabet.

Glyph: A glyph as used in this work refers to the SW symbols of SW when used as a general system for writing SL without any conscious choices for symbol preferences made. Thus, all the SW symbols found in the LMAP are referred to as glyphs. This term is used in contrast with the term 'grapheme'.

Grapheme: A grapheme, as used in this work, refers to a choice made concerning an SW glyph and its relationship to a phoneme of the given SL. Thus in this work from the list of SW glyphs used in the LMAP a grapheme-list is described.

Alloglyph: In this work the term 'alloglyph' refers to those glyphs found in the LMAP that are used interchangeably in spellings of LSM signs.

Grapheme-Variants: This term is adopted in the work to refer to the modified forms of the LSM graphemes. The term 'allograph' could have been adopted but this was avoided due since the stem 'allo-' may imply non-linguistically distinct phenomena.

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CHAPTER 1: INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

This study investigates the written form of Maltese Sign Language (henceforth LSM[2]) and how Sutton SignWriting[3] (henceforth SW) has been used and applied to the writing of pronominals and verbs of LSM. It is a linguistic study of LSM where the investigation of the written form of LSM involves the analysis of the language itself.

The application of SW for the writing of a specific sign language has only just began to be explored with the work of Bianchini (2012) for Italian Sign Language. There are a number of language-specific manuals of SW (cf. Di Renzo et al., 2011) that have been created (see Appendix A, Section A3), however whether or not these manuals are based on scientific examination of written texts of the languages is unknown. This work intends to analyse LSM SW texts in order to come to an understanding of LSM pronominals and verbs and how these are represented in written form.

[2] LSM is also used to refer to another sign language, Mexican Sign Language (cf. Quinto-Pozos, 2008). In this work LSM is used to refer solely to Maltese Sign Langauge. When any reference is made to Mexican Sign Language its name is provided in full.

[3] 'SignWriting' is written with both the 'S' and the 'W' as capital letters and with no space between Sign and Writing. Many terms related to SignWriting follow this format, for instance DanceWriting and BaseSymbols.

1.2 WHY WRITE SIGN LANGUAGES?

The first question that may be asked when examining the area of writing LSM using SW is why write a sign language? There is no known history of written sign languages, nonetheless the advantages of writing sign languages may be reasoned from the known advantages of having a writing system for a spoken language.

One advantage of a writing system is its conservative nature (DeFrancis, 1989; Gaur, 1984). It records information (Gaur, 1984) including information about the language itself in the form of dictionaries and literature. Furthermore, writing seems to have an important place in the growth and stability of a civilisation (Coulmas, 1989, p. 8), and is indispensable for education (cf. Cassell, 2004). Capovilla (2004) used SW in his dictionary and he stated the following about the importance of writing: "uma língua que não tem um registro escrito é limitada e incapaz de desenvolver-se e consolidar-se a ponto de servir de base para a constituição de um povo e de uma cultura."[4] (p. 55)

Silva (2008), another Brazilian educationalist who uses SW, mentions the benefits of reading as a gate-way to knowledge and claims that a writing system has a positive impact on thought processes of human-beings.

> A língua escrita é um recurso semiótico capaz de impulsionar positivamente o desenvolvimento do pensamento, motivo pelo qual é imprescindível para o registro, sistematização e armazenamento de

[4] "A language which does not have a written record is limited and unable to develop and consolidate to the point of serving as a basis for the constitution of a people and a culture"

> idéias, valores, conceitos, formas de ser e agir. É também um canal aberto ao conhecimento por meio da prática da leitura. Levar a termo uma proposta educacional que não consegue tornar os aprendizes surdos competentes no manejo da leitura e da escrita é impor-lhes uma condição desvantajosa em relação aos educandos ouvintes. (p. 20)[5]

Another advantage of having a writing system is that what is written is not bound by time and then disappears, like real-time signing. Writing is preserved and there are many advantages of having a preserved form of language. One example can be seen in a student who is able to reflect upon the question by means of re-reading it repeatedly.

Sign language exists within a larger linguistic community of users of the spoken language. Sign language is a minority language[6], and so the potential of a writing system for a minority language is discussed here. Where several dialects co-exist, the spoken dialect chosen to be written is usually perceived to be the prestigious dialect that eventually becomes the standard language (Milroy and Milroy, 1999). So why write sign languages when they are minority languages and certainly not

[5] "The written language is a semiotic resource that can positively impact the development of thought, which is why it is imperative for the record, systematization and storage ideas, values, concepts, ways of being and acting. It is also open to knowledge through the practice of reading channel. Carrying out an educational proposal that fails to make the appropriate management of deaf learners in reading and writing is to impose disadvantageous condition in relation to listening learners."

[6] Known exceptions: The SL used on Martha's Vineyard (cf. Groce, 2009) and Al-Sayyid Bedouin (Meir, Sandler, Padden & Aronoff, 2010)

perceived to be the standard or prestigious language of the larger linguistic community?

There is a significant difference between sign languages and other minority languages. Sign language uses the visual-gestural modality and is used by a community of people who have been hearing impaired from birth or from a very young age. These people identify themselves through their deafness, their sign language and the culture that results from the sign language (cf. Padden, 1980; Sparrow, 2005). They refer to themselves as Deaf (with a capital D) people. Deaf children born into hearing families have difficulty to acquire language, both spoken and written (cf. Brueggemann, 2004a; 2004b). Deaf users of sign language find it more difficult to access the standard languages than speakers of other minority languages.

Literacy is indispensable for education and employment where all academic disciplines depend on skills in literacy (Cassell, 2004, pp. 75-76). While children from other spoken minority language groups may have difficulty acquiring the standard language, they can physically access the spoken language through their hearing. Deaf children are unable to do so since the spoken language is patterned in a medium that is totally or partly inaccessible to them. Having a writing system for a visual-gestural language may help to acquire literacy in a spoken language (cf. Abushaira, 2007). It also provides psychological benefits for Deaf children who previously found themselves continually failing to achieve the same standard of literacy as their hearing peers (Flood, 2002).

Another reason for having a writing system for sign languages is that sign language changes at a faster rate than spoken language. This happens because sign language is very seldom carried down from one generation to the next. Writing sign languages may possibly play a part in slowing down the rapid change in language, in the same way as the written form is seen to do so for spoken language (Milroy & Milroy, 1999).

A writing system for a sign language could produce and preserve materials for deaf education. Literature, dictionaries, school subject text-books, note-taking and other educational materials could be used with deaf students and passed on to future students. Although instruction can be given using sign language, this is not preserved or made permanent for future Deaf children and adults.

If recording information was the only benefit of a writing system for spoken language, then it would have been replaced, or at least diminished, with the invention of audio recording and computer technology. Rather the use of writing seems to be on the increase rather than the decrease. People may be using less handwriting, however there is more expressive writing on weblogs and social networks than ever before[7]. Expressive writing is another advantage of having a written system.

In the same way with such high quality video recording that is accessible to all, writing sign language may seem unnecessary. However just as expressive writing

[7] http://thewritepractice.com/why-we-write/ mentions over 110 million blogs; http://snitchim.com/how-many-blogs-are-there/ lists over 239 million blogs

has psychological benefits for the hearing (cf. Barclay & Skarlicki, 2009; Seih, Lin, Huang, Peng, & Huang, 2008), expressive writing of sign language is beneficial for the Deaf (Channon, 2014, personal communication).

This work provides a step towards the establishment of writing a specific sign language, LSM. It examines the written form of LSM and it produces a manual for the SW of LSM for future reference of professionals in the fields of education, literacy, interpreting, speech and language pathology, computer programming, social and pastoral work and even for parents and carers of Deaf children and adults who wish to use the written form of LSM for their education.

1.3 MALTESE SIGN LANGUAGE (LSM)

LSM is the sign language used by the Deaf[8] people of the island of Malta, in the Mediterranean. The first special unit for Deaf Maltese children opened in 1956 within a mainstream primary school (Alexander, Mamo & Vella, Sep, 2012, p. 19). The emergence of LSM dates around this time (Alexander, May 2013, personal communication). Whether there was a sign system used amongst Deaf people in Malta prior to this time is unknown, since there are no known records of signs/gestures used by Deaf people in Malta, prior to the opening of this special unit.

[8]Woodward (1972) introduced the convention of using a capital 'D' 'Deaf' to refer to people that share a common sign language and culture. The Maltese word for deaf is 'trux'. The Maltese deaf people choose to be called 'Deaf' even when speaking Maltese, and reject the word 'trux'. A Deaf informant claimed that the mouth pattern 'trux' resembles the mouth pattern produced for the word 'ċuċ' (idiot) which may explain the Maltese Deaf people's refusal to use the word to identify themselves when speaking Maltese.

LSM appears to have different varieties arising from different age-groups. Azzopardi-Alexander (2004, p. x) notes that signs change with time when the younger generation introduce a new sign that sometimes replaces the earlier sign. Other times it does not replace the older sign and on occasion both the earlier sign and the new sign are used.

LSM is also influenced by spoken Maltese and spoken English. Azzopardi (2001) notes that the mouthings of spoken words[9] that accompany LSM signs for numbers are the patterns of English words. This occurs because English words for counting and telephone numbers are widely used in Malta. Azzopardi-Alexander (2003, p. xvii) gives an example of English influencing LSM in the sign DALMEJXIN (DALMATION) where the LSM sign is '101' referring to the story of the 101 Dalmatians. Additionally Azzopardi-Alexander (2004) notes that there is a continuum of influence of spoken Maltese on LSM:

> There is no doubt that competence in sign language can be measured along a continuum. At one end of the continuum a sign is used for a spoken word but the conversation follows Maltese grammar. At the other end of the continuum, the signs follow the grammatical rules of Maltese Sign Language. (p. x)

The only notation system that has ever been used for the writing of LSM is SW (see Section 1.3.5 and Section 1.4.2).

[9] Cf. Bank, R., Crasborn, O., & van Hout, R. (2013) for mouthings in SL of the Netherlands.

1.3.1 LSM and Family Groups of Sign Languages

Attempts have been made to classify different sign languages into different groups of sign language families (Currie, Meier & Walters, 2002; Kyle & Woll, 1985; McKee & Kennedy, 2001; Woll, Sutton-Spence & Elton, 2001; Woodward, 2000). Johnston (2003) describes a set of sign languages with a high degree of mutual intelligibility and referred to this group as BANZSL. LSM has been mentioned in Johnston and Schembri's (2007, p. 67) as showing some evidence of contact with BSL, and thus possibly part of the BANZSL group. BANZSL includes BSL (British Sign Language), Australian Sign Language (Auslan) and New Zealand Sign Language (NZSL) (Johnston & Schembri, 2007, p. 64). Azzopardi-Alexander (2004, p. x) also mentions the influence of BSL on LSM in her introduction to the second volume of the LSM dictionary.

Further evidence that LSM shares some similarities with BSL can be found in Magill and Hodgson's (2000) book of BSL signs. On the lexical level many BSL signs are similar to LSM signs; to give just a few examples from their book the BSL signs for BROTHER, SISTER (p. 104), GIRL, BABY, GROW UP, NAME (p. 109), GOVERNMENT (p. 110), EDUCATE (p. 111) and DEGREE (p. 115) are identical to the LSM signs for these glosses.

1.3.2 Who uses LSM?

LSM is used by the Maltese Deaf Community (Section 1.4). Additionally, LSM is used by sign language interpreters. Sign language interpreting in Malta began in 2001

where it was provided by a non-government organisation *Għaqda Persuni Neqsin mis-Smigħ (Malta Deaf Association*) for its members.

LSM interpreting is now provided for job staff meetings, conferences, political activities, medical-related appointments, education and religious events such as Sunday mass. The news is also interpreted into LSM by the Public Broadcasting Services on television. The use of LSM in these different interpreting situations leads to the development of LSM, since the language is used in many different specialized fields.

LSM lessons have also been developed from a level 1 to a level 2 in LSM, and are taught by two LSM teachers. These modules are provided by the Department of Education and Lifelong Learning[10] and by the Institute of Linguistics, University of Malta. Like interpreting, the teaching of LSM may contribute to the use, spread and development of LSM.

1.3.3 Varieties of LSM

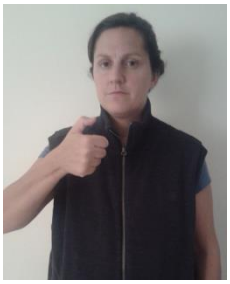
No investigation has yet been carried out regarding the different varieties of LSM. However, there seems to be at least two varieties of LSM. Evidence from this comes from a family where mother and father are both Deaf and they have a Deaf son who is now a young adult. From observations it can be seen that this Deaf young adult is able to switch from his parent's variety to and from the variety of his peers. On this basis two main varieties of LSM are identified here and referred to as the *Older* and

[10] http://www.eveningcourses.gov.mt/courses.asp?CourseId=92

Younger variety of LSM. There are possibly further varieties of LSM but this requires further investigation and will not be investigated in this work.

From observation it may be noted that the most obvious distinction between these two varieties is at the lexical level, where these two varieties use different signs (see Figure 1.1).

Figure 1.1: LSM signs from two different varieties

IL-ĠIMGĦA (FRIDAY):  vs. 

SKOLA (SCHOOL):  vs. 

IBDA' (START):  vs. 

RAĠEL (MAN):  vs. 

Whether these two different varieties of LSM differ on other levels, such as the phonological, morphological and syntactic level needs to be investigated.

1.3.4 Linguistic works in LSM

The main linguistic works carried out in LSM is the dictionary of LSM (Azzopardi-Alexander 2003; 2004). In the early 2000s Alexander started a project of compiling a dictionary for LSM using SignWriting and detailed linguistic descriptions. The dictionary has been published by volume/topic. So far the volumes *Annimali* (Animals) (Azzopardi-Alexander, 2003) and *Postijiet* (Places) (Azzopardi-Alexander, 2004) have been published. The LSM dictionary is still in progress and most of the work should be available online in 2014 (Azzopardi-Alexander, personal communication, December 2013). More about this work is discussed in Section 4.10.1.

D'Amato (1988) studied the communication of a Deaf Maltese boy. This was the first study of LSM and was followed by Porter (1995). Azzopardi (2001) used SW as transcriptions of LSM data for the first time in her study. She recorded the story-telling of two Maltese Deaf children and transcribed these stories using SW. SW was

used as a linguistic tool to analyse several linguistic aspects of LSM. Azzopardi Axiaq (2005) looked into the communication skills of a group of Deaf LSM children.

Galea (2006) looked at the LSM system of classifiers. She also used SW for the transcriptions of data. Mifsud (2010) also used SW for transcriptions of data of LSM. These studies are examined in more detail in Sections 4.10.2 and Section 4.10.3.

No work has yet studied the use of SW for LSM.

1.3.5 The use of SW for LSM

The only notation that has ever been used for the representation of LSM in written form is SW. It is the writing system used and/or known to the Maltese Deaf Community (Section 1.4). LSM texts are available in SignPuddle an online editing program created by Stephen Slevinski (see Section 8.2).

Instruction in SW has been given since 1998. SW is currently still being taught as a subject within the Institute of Linguistics at the University of Malta, where students learn Maltese Sign Language as part of their Linguistics programme of studies. In 2003 SW was taught to a group of Deaf teenagers and Deaf adults.

SW has been used for the writing of children's stories in LSM. Maltese books were translated into LSM using SW. They were written into the Malta SignPuddle (see Section 6.2). This was a project carried out by the Institute of Linguistics, University of Malta. The stories were written by myself and are used as data in this work. They were written using my knowledge of LSM and Deaf readers checked all the texts during the time of writing.

Some religious excerpts from the Bible have been translated into LSM using SW. All these works are a result of the same project. These LSM Bible excerpts are also available in SignPuddle, however some of them have been compiled and published as the Christmas story in LSM (Galea, 2008).

SW has also been used for the transcriptions of LSM raw data. The works of Azzopardi (2001), Galea (2006) and Mifsud (2010) use SW as a linguistic tool for the analysis of LSM. The transcriptions in Azzopardi (2001) are handwritten, whereas the others have used SW editing programs. The LSM dictionary (Azzopardi-Alexander, 2003; 2004) also uses SW for the notation of the LSM sign entries.

Finally SW has also been used in the field of interpreting. It has been used by interpreters[11] in schools who would write terminology for their Deaf students' records.

1.4 THE MALTESE DEAF COMMUNITY

The Maltese Deaf Community uses LSM. In 1982 the premises of the Deaf Club opened in Valletta, Malta. This place serves as a meeting point for Deaf people to socialize and interact using LSM. In the recent past the Deaf Club would open twice a week. Today it opens once a week.

A statistical figure of the number of Deaf people that are part of the linguistic community of LSM is not available. On the website of the Deaf People Association an average of 400 Maltese Deaf people is quoted (see http://www.deafmalta.com/).

[11]The researcher worked as an LSM interpreter using SW in schools during 2002-2006.

This is a theoretical number based on the statistical figure of 0.01% of the population born deaf (Van Camp, Willems & Smith, 1997, p. 758). The number of Deaf people that are part of the community is smaller. The Deaf People Association[12]had around 80 members in 2012 (Mulvaney, S.; president of the Deaf People Association Malta, personal communication, June 22, 2013).

The only statistics relating to hearing loss that are available are from the KNPD[13] (*National Commission for Persons with Disability, Malta*) who provides a yearly report on disability in Malta. This report includes annual statistics on hearing-loss. The number of Maltese people with hearing-loss amounts to 834 in 2012 (p. 43). This number includes all types of hearing loss, and not only profound deafness at birth which results in the inability to acquire speech naturally through hearing. As Johnston (2004) states: "it is only children with an early and profound hearing loss, and many with an early severe hearing loss, who are likely to be lifelong users of sign language." (p. 358)

Hearing-loss is commonly reported in old age (Cruickshanks, Wiley, Tweed, Klein, Klein, Mares-Perlman, Nondahl, 1998, p. 879), and in the US 27% of the population over the age of sixty-five reported a problem with hearing (Adams & Benson, 1990). In fact the 426 out of the total of 834 Maltese people with hearing loss who are over age sixty-five (National Commission for Persons with Disability, Malta, 2012, p. 43).

[12] For more information see:www.deafmalta.com

[13] For more information see:www.knpd.org

The number of people with hearing loss in Malta, younger than 65, thus amounts to 408. The population of Malta amounts to around 400,000, precisely a count of 421,364 in 2012 (*National Statistics Office*, Malta, 2013, p. vii), hence the estimation of 400 Maltese people born with hearing loss quoted by the Malta Deaf Association is considered to be reliable.

1.4.1 Literacy and the Maltese Deaf

It is not the intention of the work to discuss at great length issues of literacy and deafness. It will simply be mentioned here that Maltese Deaf children, like all Deaf children across the globe, are at a disadvantage when it comes to literacy, since they have limited access to the spoken word (Azzopardi-Alexander, 2008, p. 49).

> Clearly, the hearing-impaired child arrives at the task with a double problem: not only does he not know the coding principles of the written symbols, he does not have adequate command of the phonemic code and language structures into which he must decode these symbols. (Bamford & Saunders, 1991, p. 209)

SW may offer psychological benefits for the improvement of literacy in a Deaf child. Contrary to a Deaf child's learning of the written medium of the spoken language, when learning SW he/she does not feel at a disadvantage or helpless at acquiring the writing skills. When using SW the Deaf child is in command since he/she knows the coding principles of the SW symbols and also has command of the phonemic code and structures of her sign language to decode SW glyphs (Flood, 2002).

1.4.2 Use of SW by the Maltese Deaf

Several Maltese Deaf people show that SW is an accessible and acceptable writing system for them. Ten Deaf individuals have had formal training in SW. Seven of these participated in a SW workshop, two are research assistants at the University of Malta and one was a reader on the LSM projects (see Section 1.3.5). All were observed picking up SW with ease. During the SW workshop held at the University of Malta in 2003, the individuals were able to write a small piece of text of LSM using SW just after three days. Bianchini (2012) also observed and confirmed that SW is a system that is acquired with great ease by native LIS signers.

In addition to the ease of learning SW, the participants did not lose their skills across the years. At the launch of the *LSM Dictionary* in 2004, the launch of the *Christmas story* in 2008 and throughout this study up to 2013, it was observed how those who were given formal instruction retained their skills in reading SW. Within minutes of refreshing the basic principles of SW, they were observed reading the dictionary entries (Azzopardi-Alexander, 2003; 2004), the *Christmas story* (Galea, 2008) and the exercises of the reading-questionnaire used for this study (see Appendix C).

These ten have also been observed passing on SW to their Deaf peers and families. This means that the number of Maltese Deaf people who can read SW may be higher than the known ten. SW is without doubt accepted as a writing system by the Maltese Deaf, where pride in SW has been repeatedly reported to the researcher.

Only one Deaf SignWriter has ever reported a negative attitude towards SW. This individual expressed two concerns during the reading-questionnaire (Appendix C).

The first regards the small number of Deaf people who will need SW since Deafness is decreasing with the increase of cochlear implants. This attitude towards SW has also been noted by Hoffmann-Dilloway (2013, p. 245 footnote 3). The second concern expressed was about the large amount of glyphs available for writing LSM (see Chapter 2). This individual stated that the large choice is 'confusing' when it comes to deciding on how to write LSM.

1.5 MOTIVATION AND METHODOLOGY

Motivation for this study emerged from the researcher's experience of SW and using the system as a transcriptional system for LSM (Azzopardi, 2001; Galea, 2006), from her involvement with the LSM dictionary (Azzopardi-Alexander, 2003; 2004), and from her work as a research assistant producing SW LSM children's stories, prayers, and biblical passage translations.

Most particularly during the period of production of literature of LSM texts (2008-2010) and through feedback from Deaf readers, some problems with the reading of the texts became evident (see Sections 1.8.1-1.8.3). These issues led to the questioning of how LSM could become clearer in written form.

This dissertation is primarily qualitative. The dissertation describes the language, LSM, using its written form as data. The linguistic study of LSM is based on theoretical works in sign linguistics (Chapter 4) and feedback from Deaf readers.

This is the first known attempt to use written texts for sign linguistic investigation. Such a method has never been previously carried out because written texts of sign

languages have not been previously available (see Appendix A, Section A2). Sign language written corpuses are only now beginning to expand enough to be considered valuable data (see Appendix A, Section A9). The work here is a first attempt and may help to establish a new field of investigation: that of the linguistics of written forms of sign languages.

The LSM texts found in SignPuddle and used as data for this work are relatively numerous (Section 8.3). Despite the limitation with the number of writers of these texts (Section 5.8), they are considered to be highly valuable for this qualitative study since they indicate how SW is used and applied to writing texts in a specific sign language. Furthermore at the time of their writing, these LSM texts were read and checked by Deaf SignWriters who often gave valuable feedback regarding the readability of the LSM texts. Some of this feedback is included in this work.

To further compensate with the small number of writers of the LSM texts a questionnaire was formed concerning the writing issues identified in the LSM texts, and ten Deaf participants provided feedback. Their answers to the questionnaires were processed and the results are considered to be an essential part of the work.

Although the work is primarily descriptive and theoretical, it has an applied stance since recommendations for writing LSM are made. These are finally gathered into a LSM SW manual that may be used as a guide to writing LSM.

A brief description of the methods used in this work is provided here. For a full account of the methodology please refer to Chapter 5. One method adopted was an analysis of SignPuddle 2.0 and the Malta Literature Puddle (the LMAP) (Chapter

8). SignPuddle 2.0 is the editing software that was used to write the LSM texts (see Section 8.2). This analysis was carried out in order to understand the extent to which this software is used by other sign languages globally.

Secondly a linguistic analysis of pronominals and verbs in the LSM texts was carried out (Chapters 6 and 7). This was two-fold. The LSM texts were analysed in terms of their readability. Written forms in the LSM texts that could not be read clearly were further analysed through an attempt to understand the LSM pronominal and verbal forms and propose written forms that could be read more easily (Chapters 9, 10).

A questionnaire that involved the reading of LSM was used in order to observe and collect data related to Deaf readers' views regarding the written form of their language (Section 5.5). Ambiguous SW LSM spellings were identified and analysed in order to eliminate ambiguity and other difficulties observed in reading.

1.6 SIGNWRITING (SW)

SW is a writing system invented by Valerie Sutton in the 1970s. Chapter 2 describes SW in considerable depth. It is not the only notation system for sign language (see Chapter 3), however it is the only known system that is used for expressive writing as can be seen in a growing body of literature in different sign languages (see Appendix A, Section A2). In this work it is asked what type of writing system is SW (see Section 3.6).

1.6.1 SW: Previous Research

There is little known research about SignWriting from the field of linguistics. Research concerning SW comes from other disciplines. These include education, linguistic anthropology and computer programming. Not all the research is relevant to this work. These academic works are mainly dissertations at master and doctoral levels and a few academic articles.

In the field of education, a few researchers have carried out research that indicates a positive effect of using SW in a Deaf child's education. The first known work was carried out by Gangel-Vasquez (1998) who conducted a study on assessing the reading skills of Deaf children using SW. She demonstrated the ability of the deaf to learn reading and writing in Sign Language at different levels including beginner level.

Rosenberg (1999) concluded that the success of SW is evident by its use in the deaf communities of many countries. She also claims that SW may provide a bridge for the deaf to learn spoken language.

Flood (2002) showed that Deaf and hearing-impaired students learned SW quickly, concluding that they were active learners. In her conclusions Flood (2002) provides recommendations to include SW in the educational curriculum for the deaf and hearing impaired. In addition her research points to the fact that SW may be beneficial in the bi-literate acquisition of spoken and sign language (see also Section 3.9).

Abushaira (2007) studied the effectiveness of SW on the educational achievement of the Deaf. His conclusions indicate that SW has a direct positive effect of the educational achievement of the Deaf (see also Section 3.9).

Another discipline that has investigated SW is the field of anthropological linguistics. Hoffmann (2008) carried out her doctoral dissertation looking into the standardization of a sign language through the use of several means, including SW. She also used SW for the transcriptions of her data. Hoffmann-Dilloway (2011) later also investigated SignWriters' ideologies towards SW and found that they often challenge dominant ideologies about the nature of language and writing.

Thiessen (2011) investigated the written script of SW from another discipline, computer science. His master's thesis investigated the principles and rules of SW. He analysed the flexibility of the system in the placing of symbols or 'glyphs' (Section 2.8) in relation to one another and the consequences of this in the discipline of computer script writing and Unicode issues.

The first study to have ever investigated the use and application of SW for a particular language is Bianchini's (2012) work for Italian Sign Language (LIS). She investigated the meta-linguistic awareness of LIS SignWriters. The study looked into the use of the SW glyphs (Section 2.3.2 for definition) for the writing of LIS (Italian Sign Language). One of her conclusions was that further SW glyphs are required, since not all glyphs follow the same pattern of sizing (see more in Section 2.6).

Despite Bianchini's findings that more glyphs are required, the analysis of the LSM texts led to the opposite conclusion, i.e. fewer glyphs were required since there

were several different glyphs of similar shapes that were used interchangeably for the spellings of the same signs. The spellings that used different yet similar glyphs interchangeably, could thus be read with either one of the variant glyph-shapes (full details in Chapter 8). More about Bianchini's (2012) work can be found in Section 3.8.6.

1.7 SIGNWRITING LSM: SW GLYPHS

It is assumed that no sign language requires all SW symbols (from now on 'glyphs'; defined in Section 2.3) (Sutton, 2011) for its writing. This assumption has only been tested by Bianchini (2012) who concluded that additionally glyphs were required. This work seeks to answer this question for the writing of LSM (Chapter 8).

An analysis of the number of glyphs and an attempt to arrive at a glyph-set for the writing of LSM is carried out in this work. This has never been examined before for LSM and it provides an indication of the phoneme system of LSM, an area that is yet to be described for this language.

Furthermore an analysis of the glyph-sets used by other sign languages is carried out. The analysis of the glyph-sets of other sign languages is carried out with caution due to limitations with the data (see Section 8.4). Despite this limitation it was decided to include the results in this work, as they may give some intuition into the way other sign languages use and adapt SW and may be built upon with future research.

1.8 BEYOND THE PHONETIC USE OF SW

The analysis of the writing of LSM goes beyond its SW glyph-set. SW has been used largely as a phonetic system where different spellings often represent differences in features irrespective of whether they are meaningful or not. On the other hand morpho-phonemic spellings occur when the morphemes of a language are reflected by standardized uniform spellings (DeFrancis, 1989, p. 185). This work examines LSM morpho-phonemic SW spellings.

It is questioned how morphological patterns of LSM are represented using SW. LSM, like all sign languages, is realized in three dimensional space. How is this represented in written form that is two dimensional? The main areas of investigation are as follows: 1) the LSM pronominal system (that includes agreement verbs and pointing signs), 2) the LSM classifier system, and 3) the LSM sign modification to express plurality, duality and size-incorporation. The questions asked concerning these areas are: How can they be written, using SW, in order to be read with ease? No other known study has yet investigated the morpho-phonemic spellings of a sign language. This is one way in which the study is innovative.

The linguistics of LSM has not yet been fully described. The major contribution to the field is the LSM dictionary (Azzopardi-Alexander, 2003; 2004). There are also some linguistic dissertations at undergraduate and master levels (cf. Galea, 2006; Mifsud, 2010). These works are examined in Section 4.10. Through the examination of the morpho-phonemic spelling of LSM, some of the gaps in the linguistic description of these areas of LSM are filled.

1.8.1 Writing of the LSM pronominal system

LSM SW pointing signs was the first area to be recognised as unclear with the representation of pointing signs. Spellings that included the index finger and movement were highly ambiguous and at times identical, e.g. HEMM (THERE), HU/HI (HIM/HER) (see Section 6.5). It was thus a natural first step to investigate this area as part of this work as it was the most evidently ambiguous area in the SW texts of LSM.

Figure 1. 1: An identical form in SW that was read as both HEMM (THERE) and HU (HIM).

HEMM (THERE) or HU/HI (HIM/HER)

In LSM, like other languages, there are several different meanings that arise from a combination of index finger pointing to different points in space (cf. Cormier, Schembri & Woll, 2013). Since these distinctions could not be 'read', the question asked was what could be changed in the SW LSM spellings of pointing signs in order for the readers to access the intended sign? These pointing signs lead to the study of the LSM pronominal system and agreement verbs of LSM, which is based on the grammatical use of space (Klima and Bellugi, 1979).

The pronominal system and agreement verbs of LSM have not yet been investigated. The work here fills in this gap in the knowledge of the pronominal system (see Chapter 10).

1.8.2 Writing of the LSM whole entity (WE) classifier verbs

The SW of the LSM classifier system did not seem to create problems in reading, e.g. KAROZZA-MIEXJA (see Figure 1.2). However some Deaf readers commented about the ambiguity of the directionality of the SW of WE classifiers and movements. Thus the placement of the SW glyphs in relation to one another was investigated and the Deaf participants in this study were asked for their preference in order to move towards a regular way of writing this flexible system of classifiers in LSM.

Figure 1. 2: SW of LSM whole entity classifiers – different forms appear to represent the same meaning.

CL-VETTURA-MIEXJA 'L QUDDIEM (CL-VEHICLE-MOVING FORWARD)
CL-VETTURA MIEXJA 'L QUDDIEM (CL-VEHICLE-MOVING FORWARD)

The LSM WE classifier system has been studied in Galea's (2006) work. This work adds to the description of the classifier system of LSM and discusses its written form for the first time.

1.8.3 Verbs in the LSM data

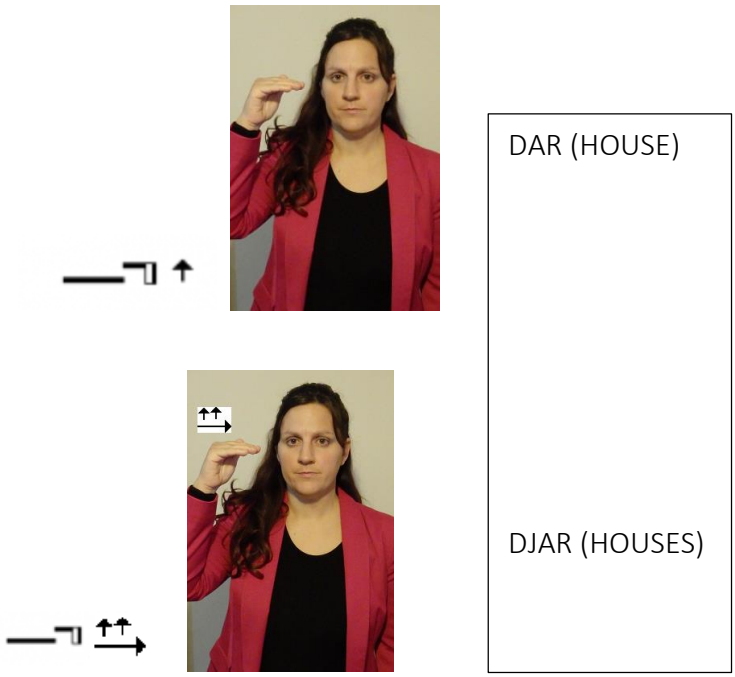
A linguistic analysis of SW LSM verbs is carried out in Chapter 7. From the data SW verbs are categorised according to different forms and modifications. The analysis provides a description of verbs in LSM on the basis of their written form. In Section 7.2 the issue concerning word-classes is discussed. In Section 7.5 plain verbs in the LSM texts are analysed. Within the class of plain verbs, handle classifier verbs are

analysed in Section 7.5.3. Whole Entity (WE) verbs are analysed in Section 7.6 and Agreement verbs in Section 7.7.

1.8.4 Writing of LSM plurality

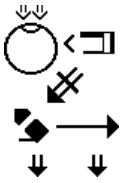
Plurality in LSM is often realized by reduplication (Azzopardi-Alexander, 2003; 2004) e.g. DAR (HOUSE), DJAR (HOUSES) (see Figure 1.3). In Section 6.3 data regarding plural forms is presented and it is investigated whether plural morphemes for LSM can be written constantly using SW.

Figure 1. 3: The distinction between a singular and plural form of LSM in SW



In Section 6.3 the difference between a plural and a dual morpheme in LSM is identified and described (see Figure 1.4). On the basis of this analysis it is then suggested to disambiguate between these two similar yet distinct LSM morphemes in the SW spellings for LSM.

Figure 1. 4: The SW form has been used for the writing of both TFAL (CHILDREN) and TFAL-TNEJN (CHILDREN-TWO)



ŻEWĠ-SUBIEN (TWO-BOYS) (Luqa10v11)[14]

It was observed that in the LSM texts this modification was not always read with ease. Plurality has been described in the LSM dictionary (Azzopardi-Alexander, 2003; 2004). However this is the first time that the written form of LSM plurality is being investigated.

1.9 ROAD-MAP OF THE WORK

In this work Chapter 2 is provided to give the reader some background regarding SW and the ISWA 2010, since SW is the focus of the work and hence many examples and figures throughout the work are presented in SW. Thus it is considered beneficial to provide a key to deciphering SW at the start of the work. The literature review in this work is separated into two chapters Chapter 3 concerns literature relating to writing systems of the world and other notation systems for sign languages. Chapter 4 presents literature concerning sign linguistic issues related to the areas investigated in this work, i.e. sign language and duality of patterning and different types of verbs in SL: plain, agreement, spatial and classifier verbs.

[14] More on how to find the data used in this work in Section 6.2

In Chapter 5 the methodology used in this work is described. Chapters 6 and 7 present the analysis of the work. Chapter 6 considers LSM SW forms of plurality, pronouns and pointing signs. Chapter 7 consists of the analysis of the SW forms of different verb-forms in LSM.

In Chapter 8 an analysis of different Sign Puddles for different sign languages is carried out and then the glyph-set of LSM extracted from the LMAP is analysed in further depth. The analysis of LSM SW words and sentences is carried out in Chapter 9 and finally Chapter 10 offers an analysis of the signwritten forms of pronominals in LSM and includes the analysis of agreement verbs in LSM and of their SW forms.

Chapter 11 presents answers to the research questions outlined at the end of Chapters 3 and 4 as well as a general conclusion to the whole dissertation.

1.10 CONCLUSION

In this chapter the scope, methodology and motivation for the work were outlined. Some background information was provided about LSM, the Maltese Deaf, and the use of SW for LSM. The main task of the work is to understand how LSM uses SW and through this understand more about the language LSM.

CHAPTER 2: SIGNWRITING (SW)

2.1 INTRODUCTION

This chapter is structured as follows: Section 2.2 explains how SW evolved from DanceWriting. Section 2.3 explains the use of the terms ‘glyph’ and ‘grapheme’ in this work. Section 2.4 briefly explains how SW glyphs developed over time. Section 2.5 explains some basic principles of the SW system. Section 2.7 presents the organization of the SW glyphs. Section 2.8 presents a synthesis of Thiessen’s (2011) work. Section 2.9 describes two basic guidelines recommended to be followed when writing SW signs. Section 2.10 explains a little about the handwriting of SW and Section 2.11 describes an issue about the amount of space SW takes on paper.

Sutton-Spence & Woll (1999, p. xi) note that it takes a very long time to learn a transcriptional system. This may not be so for SW, an iconic/transparent writing system comparable to the Korean Han’gul script (see Section 3.5.2).

> The writing system is based on writing body movement. It does not stand in judgement of how people sign, but instead writes what we see and feel. We write "pronunciation" of signs. The SignWriting Alphabet can be used to write any sign language in the world, because signers in each country can learn the symbols and apply the writing system to the sign language they know. (Sutton, 2011, p.7)

SW as a system contains enough glyphs to write any sign language. It is analogous to the IPA (International Phonetic Alphabet) for spoken languages.

2.2 FROM DANCEWRITING TO SW

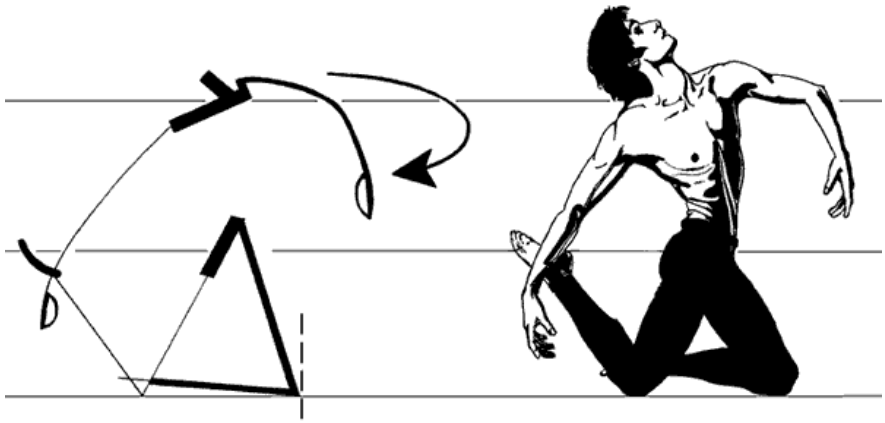
The general movement notation system is called the 'Sutton Movement Writing'. Sutton Movement Writing has five branches: DanceWriting, SignWriting, MimeWriting, SportsWriting, and MovementWriting (Sutton 2011, p. 4). This work is an investigation into just one section of Sutton Movement Writing, that of SignWriting (SW).

Sutton Movement Writing was invented in 1974 by Valerie Sutton. It was immediately called a 'writing system' as opposed to other notation systems for sign languages (Section 3.7). Part of the name 'SignWriting' includes the word 'writing. SW emerged from a field completely unrelated to linguistics: dance. Sutton was a professional ballerina, forced to stop dancing due to illness. This pushed her to invent a notation system that could transcribe movements of the body in order for her to continue using her dance talent to produce choreography.

While Sutton was teaching DanceWriting to the Royal Danish Ballet (1974), researchers at the University of Copenhagen came across Sutton's system. They asked Sutton to transcribe gestures used in spoken languages for a research project that compared spoken language gestures to sign language. After transcribing gestures Sutton became inspired by the idea of creating a writing system for sign languages, this was the beginning of SW, although during these early stages SW was

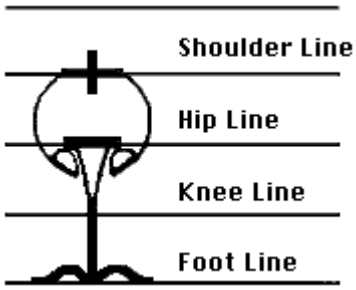
very different and used a stick figure similar to that used for DanceWriting (see Figure 2.1).

Figure 2. 1: An example of DanceWriting; image reproduced from www.signwriting.org *with full permission.*



With time SW changed and today it is very different from DanceWriting. While DanceWriting still uses the stick-figure to represent movements for the whole body including legs and feet (see Figure 2.2), SW does not. Sign language articulation occurs within the 'signing space' (see also Section 10.2), an area around the signer's body that is in line with our human physical capacity for peripheral sight.

Figure 2. 2: DanceWriting is based on a stick drawing including the different sections of the whole body from shoulders to feet. Image reproduced here with permission from Valerie Sutton from www.signwriting.org



Although it stands to be tested, Sutton and Frost (2011) claim that SW is used by thousands in over forty countries. SW is listed as an established world script by the International Organization for Standardization (ISO-15924-Sgnw).

Shouting (cf. Crasborn, 2001) and poetry (cf. Russo, Giarunno & Pizzuto, 2001) in sign language result in the hands moving outside of the signing space. SW contains glyphs that can represent this paralinguistic information, such as limb glyphs found in Group 28 (Sutton, 2011) and large movements found in Groups 13-20 (Sutton 2011). In spoken languages paralinguistic information such as this is often included by means of punctuation symbols[15]. SW includes punctuation glyphs found in Group 30 (Sutton, 2011).

[15] In the writing of electronic emails and text messages 'smileys' do in many ways convey paralinguistic information such as the tone of the whole message. Imagine an example such as 'I'm furious with you ☺' Here the meaning is the opposite of what the words entail.

2.3 GLYPHS AND GRAPHEMES: TERMINOLOGY

In this work the term 'glyph' is used to refer to an SW symbol. Glyphs are the written forms of the phones of sign language (see Section 2.3.2). This term contrasts with the use of the term 'grapheme' that refers to the written form of a phoneme of a given sign language (see Section 2.3.3).

The term 'symbol' is used in this work in the broad sense, meaning "something that represents or stands for something else, usually by convention or association, especially a material object used to represent something abstract." (www.collinsdictionary.com).

The terms 'grapheme', 'glyph' and 'symbol' are not used as defined by Slevinski (2012, p. 6), since he uses the terms in the field of programming rather than linguistics.

2.3.1 SignWriting (SW)

The full name of the writing system is the 'Sutton SignWriting System'. Abushaira (2007), Aerts, Braem, Van Mulders and Weerdt (2004), Bergeron (2004) and Thiessen (2011) use the shorter version of this full name 'SignWriting'. Other researchers have used abbreviations of this name. Hoffmann (2008) abbreviates the Sutton SignWriting System to 'SSW' and in a later work (Hoffmann-Dilloway, 2011) she abbreviates it to 'SW'. Bianchini (2012) also uses the abbreviation 'SW'. Likewise in this work the abbreviation 'SW' is used.

The word 'SignWriting' is also modified creating the term 'SignWriters' to refer to people who write SW. The term 'SignWritten' is occasionally used in replacement

for ‘written’ when used in the context of SW, and ‘SignWriting’ is sometimes used in the gerund form.

The ‘ISWA 2010’ is the most recent and final list of glyphs of SW. ISWA stands for the ‘International SignWriting Alphabet’. An earlier version is the ‘ISWA 2008’.

2.3.2 SW Glyphs

Borgia, Bianchini, Dalle and Marisco (2012) use the term ‘glyphs’ to refer to the SW symbols of the ISWA. The term ‘glyph’ is derived from the word ‘hieroglyph’ and has been used for units not well understood in the description of writing systems (Coulmas, 1999, p. 168).

SW glyphs are phonetic; i.e. each glyph represents a ‘phone’. The ‘phone’ is “a term used in phonetics to refer to the smallest perceptible discrete segment of sound in a stream of speech.” (Crystal, 2011, p. 361). In sign language the ‘phone’ is the smallest perceptible discrete *visible* segment. For instance two B-Hand phones represented by two separate SW glyphs can be seen in Figure 2.3.

Figure 2. 3: Two B-Hand phones and corresponding B-Hand glyphs

Thus since each glyph is a representation of a ‘phone’, SW may be described as an alphabet (see Section 3.5.3).

However at times SW glyphs represent more than one discrete perceptible unit, for instance the following phone  consists of both the B-handshape, the palm orientation and the palm rotation. The SW corresponding glyph is , which contains the information of both handshape, orientation and rotation. On the basis of this, SW can, and has been described as a featural system (Van der Hulst & Channon, 2010). In this work, it is claimed that SW as a general system is a featural writing system.

‘Phonetics’ is defined as “the science which studies the characteristics of human soundmaking, especially those sounds used in speech” (Crystal, 2011, p. 363). Despite the strong link of these terms to spoken language and the auditory medium, these terms have been applied to the study of sign languages (cf. Brentari, 1998;

Crasborn, 2001; Emmorey & Corina, 1990; Liddell & Johnson, 1989; Poizner, 1981; Stokoe, Casterline, & Croneberg, 1976; Tyrone & Mauk, 2010).

2.3.3 SW Grapheme

In this work the term 'grapheme' is used in relation to the term ‘glyph’ (Section 2.3.2), where unlike a glyph, a grapheme is “the minimal contrastive unit in the writing system of a language.” (Crystal, 2011, p.220). The index finger glyph and the U-hand glyph are minimally contrastive in LSM since they result in two different written signs ISEM (NAME) and KUNJOM (SURNAME), thus they may be considered to be graphemes of written LSM. When analysing a writing system the first task is to compile a list of the graphemes of that writing system (Coulmas, 1999, p. 174), a task attempted in Chapter 8. The grapheme-set of a given written language may be indicative of the phonemes of that language.

2.4 DEVELOPMENT OF SW GLYPHS

SW started as a handwritten form (Section 2.10) however over the years software programs have been developed to edit SW on computers (Sutton 2011, p.12). The first program to be developed was created in 1986, by Richard Gleaves. This program was designed to work with the first PCs, the Apple //e and //c, and was called ‘SignWriter’. This program used a typing method that may still be used in the SignWriter DOS program. SignWriter became a standard and a base for future coding of SW glyphs.

The next SW program created was called SignBank. Until 2004 the SW glyphs were referred to as the IMWA 2004 (International MovementWriting Alphabet). The ISWA 2008 replaced this. IMWA 2004 included glyphs that were not used in SignWriting (Section 2.2) and these were removed in the ISWA 2008. The final version ISWA 2010 was created to improve the design of the ISWA 2008, where it was decided that changes were needed from the programming perspective[16] (Sutton 2011, p. 14).

The ISWA 2008 and ISWA 2010 were developed by Sutton and Slevinski (Sutton, 2011). Sutton worked on the creation of new SW glyphs and Slevinski was responsible for the programming and the creation of SignPuddle, the current SW editing software.

> The ISWA 2010 is the world standard for SignWriting software. We do not plan to make any more changes to the symbol set. SignWriting software can now become stable around the world. (Sutton, 2011, p. 14).

Besides SignPuddle there are two more software programs available that were developed by others. There is the Swift program created in Italy for SW editing of LIS (Bianchini, Borgia & Marsico, 2012). Another program is Sign Studio created by Duncan[17]. Finally there is also the DELEGS[18] program created by Hamburg University.

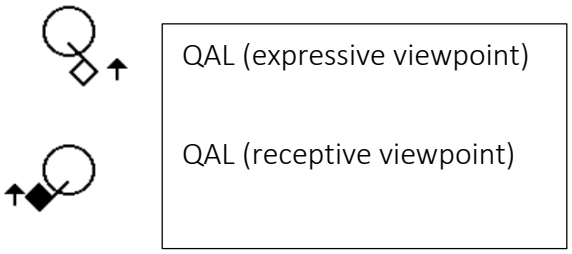
[16]For more details see: http://signpuddle.net/wiki/index.php/ISWA_2008#Successor
[17] http://www.signwriterstudio.com/download.htm
[18] http://www.delegs.com

2.5 BASICS: EXPRESSIVE VIEWPOINT AND PALM ORIENTATION

In a sign language exchange between signer and addressee, there are two view-points involved. There is the signer's viewpoint and the addressee's viewpoint. Holding your B-Hand upright with your palm facing out there are two view-points at hand, your own as a signer where you see the back of your palm, and the addressee's who sees your palm.

Either viewpoint may be adopted when choosing to write or transcribe a language for the first time. Researchers transcribing data have found it useful to use the receptive viewpoint on the basis of transcribing from video recordings and thus transcribing receptively from the videos may facilitate the transcriptions (cf. Hoffmann, 2008).

The only instance that would create confusion would be the mixing of expressive and receptive viewpoints when writing SignWriting for a given language. This would result in the same sign written differently, e.g. QAL (SAY) (write expressive and receptive view).

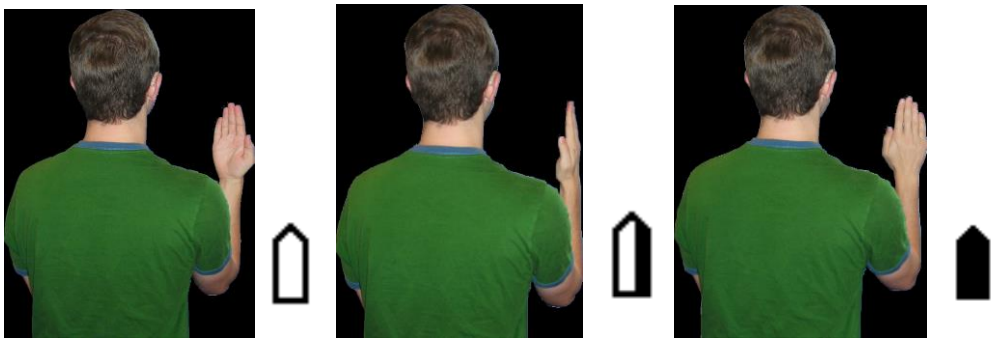


All known LSM texts have used the expressive viewpoint: those found in SignPuddle (see Section 8.3), transcriptions of signs in the LSM dictionary (Azzopardi-Alexander,

2003; 2004) and transcriptions of raw data of LSM (cf. Azzopardi, 2001; Mifsud, 2010; Galea, 2006).

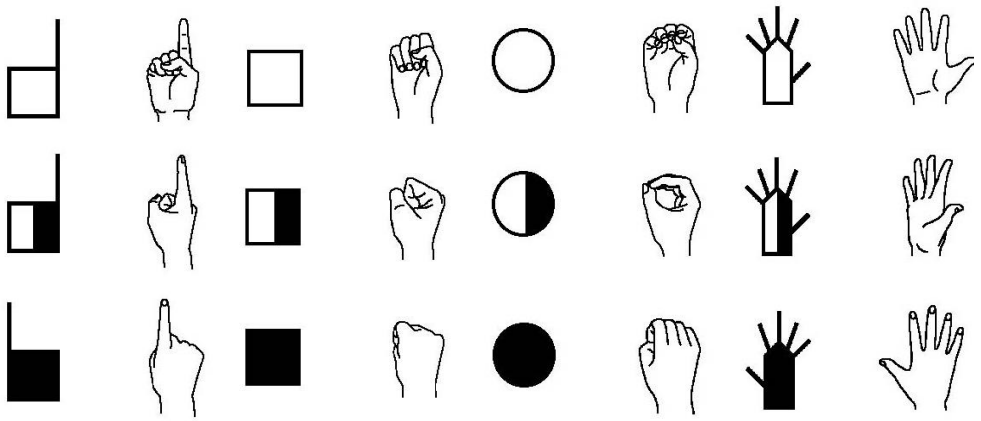
The expressive viewpoint can be seen in Figure 2.4. Palm facing the signer is not shaded. Palm facing sideways is half shaded and palm facing out is shaded black.

Figure 2. 4: The Expressive Viewpoint with corresponding SW glyphs. Photographs reprinted with permission from Valerie Sutton, www.signwriting.org



Using this pattern of shading glyphs, all handshape glyphs are patterned in the same way (Figure 2.5) in order to represent orientation.

Figure 2. 5: Further handshape glyphs following the pattern of hand orientation by means of regular shading of the glyphs (images taken from www.signwriting.org with full permission)



2.5.1 Relative positioning of SW glyphs with one another

Additionally in the expressive viewpoint the relative position of the glyphs with one another in a sign follow the principle even when placing glyphs in relation to one another. For instance, when a head glyph is part of the sign, and the right hand touches the right side of the head it is written expressively, i.e. with the glyph representing the right hand written on the right side of the glyph representing the head, e.g. ISEM (NAME):  

The palm of the hand may also be positioned on a vertical or horizontal plane. In the examples of Figures 2.4 and 2.5 the orientation of the hand is upright, parallel to the wall (Sutton, 1995), or rather set on a vertical plane. The hand can also be positioned parallel to the floor (Sutton, 1995) or positioned on a horizontal plane. When the hand is parallel to the floor the handshape glyph is different from the same handshape parallel to the wall. The glyph representing the handshape that is parallel to the floor has a space at the knuckle joint. For instance the glyphs  Baby-C,  B, and  Index are parallel to the wall, but when they are parallel to the floor they change slightly to  ,  ,  The orientation of handshapes parallel to the floor that change slightly in glyph shape can be seen in Figure 2.6:

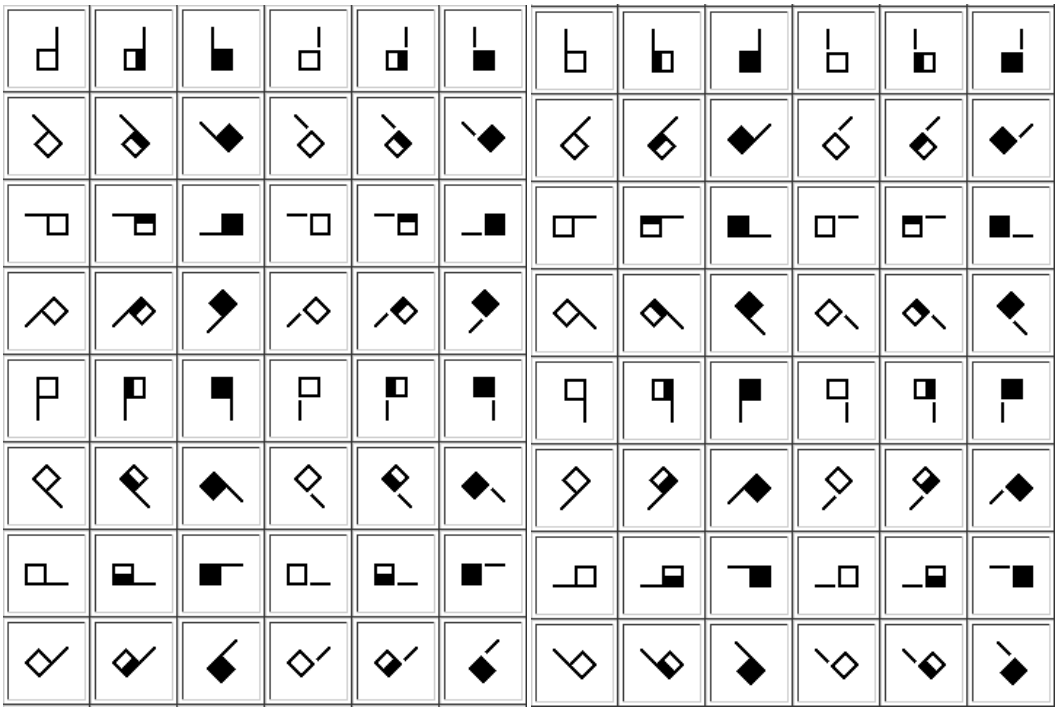
Figure 2. 6: Orientation on a vertical plane. Photos of Adam Frost in Sutton and Frost 2013, used here with full permission

2.6 SW NUMBER OF GLYPHS

SW consists of 652 glyphs known as BaseSymbols. In this work these will be referred to as BaseSymbol Glyphs. Each one of these glyphs has a different of number of

variations, for instance the Index Finger  counts as one BaseSymbol, however this handshape can be rotated. With all its possible rotations and orientations there are 96 glyphs that represent the Index Finger  (see Figure 2.7). When all the variations of the BaseSymbol glyphs are counted the ISWA 2010 glyph-set amounts to 37,811 glyphs (Slevinski, 2012, personal communication).

Figure 2. 7: Variations of the BaseSymbol glyph index finger 

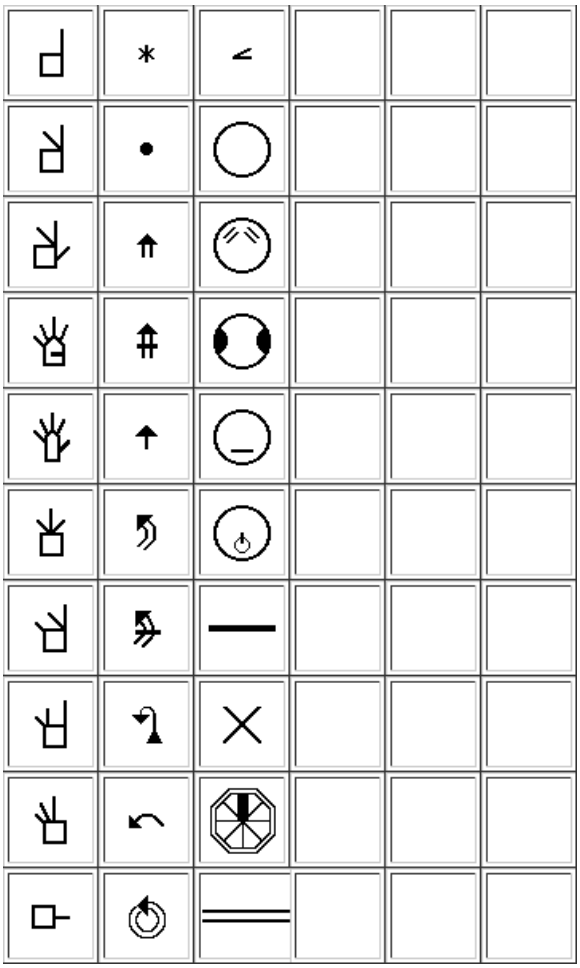


2.7 ORGANIZATION OF THE SW GLYPHS

SW is categorized into the following seven categories: 1) Hands [Groups 1-10], 2) Movement [Groups 11-20], 3) Dynamics and Timing [Group 21], 4) Head and Face [Groups 22-26], 5) Body [Groups 27-28], 6) Detailed Location [Groups 29], and 7)

Punctuation [Group 30]. All these categories together form the 30 groups of SW that can be seen in Figure 2.11.

Figure 2. 8: The 30 Groups of Glyphs of SignWriting (Image used with permission from Valerie Sutton in Sutton 2011, p. 24)

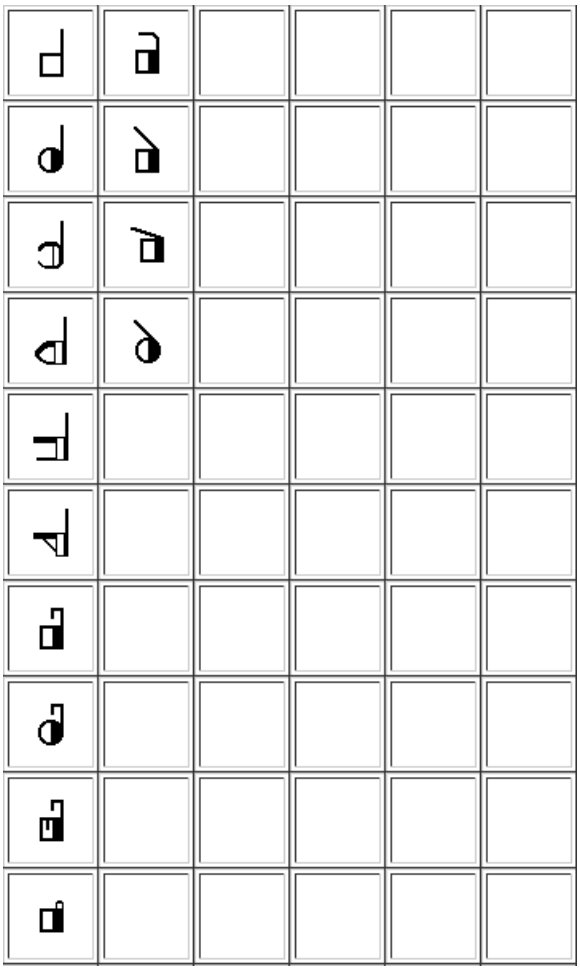


Each group consists of a specific configuration, e.g. a specific handshape e.g. index-finger that marks the type of handshapes that are all included in that group. All the glyphs included in these group are called BaseSymbols (Sutton 2011).

For instance Category 1 consists of all the handshapes of SW and these are then organized into ten groups. Each group then consists of a list of related handshapes

that are the BaseSymbols of SW, as can be seen in Figure 2.12 for the list of related handshapes of Group 1. Each one of these BaseSymbols then has a list of rotations and orientations that were discussed in Section 2.6.

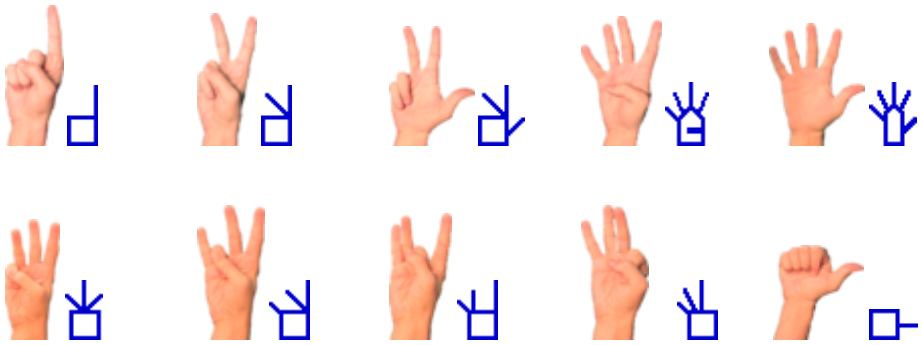
Figure 2. 9: BaseSymbol Glyphs for Group 1: Index Finger Group



2.7.1 SW Handshapes Glyphs (Category 1)

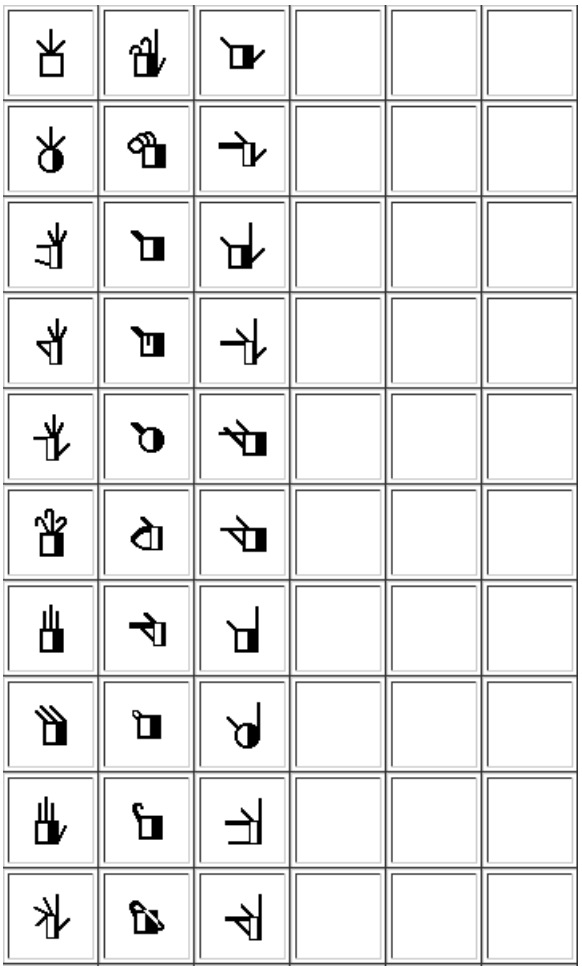
There are ten different groups of handshape glyphs in SW, categorized into Groups 1-10 of the ISWA 2010. These glyphs are based on the American Sign Language (ASL) numbers from one to ten (Figure 2.13).

Figure 2. 10: BaseSymbol Handshape Glyph representing the 10 groups of handshape glyphs, based on the ASL 1-10 numbering system (Handshape photos of Adam Frost, reproduced here from Frost & Sutton (2013) with permission)



Usually the handshapes in the groups have similar configurations such as the difference between these two glyphs from Group 1:  and  . However there are also handshapes within the same group that are very different in form. For instance, the  (W-handshape glyph) and  (Y-handshape glyph) are glyphs of the same Group 6 (Figure 2.14) but are not perceived as being part of the same group by LSM SignWriters.

Figure 2. 11: Handshape Glyphs of Group 6 of the ISWA 2010



Thiessen (2011) re-categorises the ten handshape groups into three basic handshape groups: palm, fist and cup. In this work the ISWA 2010 categorization of ten handshape groups are used.

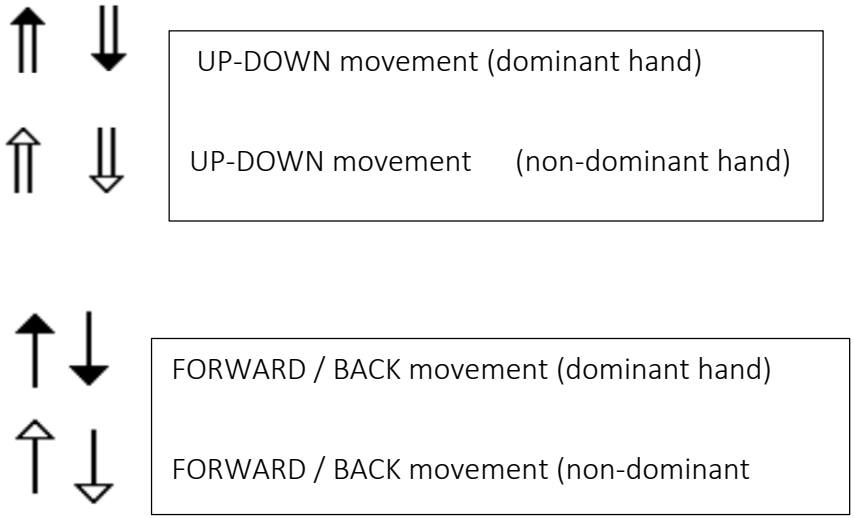
2.7.2 SW Movement Glyphs (Groups 11-20)

SW Category 2 consists of Groups 11-20 that represent movement in sign language. The full list of ISWA glyphs can be found in Appendix B. A few basic principles are provided for the writing of movement in SW.

When a hand comes in contact with another hand or part of the body, different glyphs represent different types of contact. Some of the glyphs that represent contact are: touch , strike , grasp , brush , in-between , and rub (see Appendix B).

Hand movement is represented by arrows. Dark arrows represent movement of the dominant hand, while white arrows represent movement of the non-dominant hand (Section 4.10.1). A double lined arrow represents UP/DOWN movement, i.e. on a vertical plane, and a single lined arrow represents FORWARD/BACK movement, i.e. on a horizontal plane (see Figure 2.15).

Figure 2. 12: Up-down vs. Forward-Back and Right and left hand shading



Arrows that are straight, curved or zigzag are iconic representations of these different types of movement (Figure 2.16).

Figure 2. 13: SW Movement glyphs parallel real life movement

ZIG-ZAG UP movement

FULL CIRCLE movement

Longer arrows represent longer movements whereas shorter arrows represent shorter movements (see Figure 2.17).

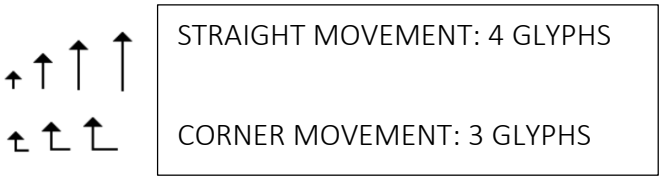
Figure 2. 14: SW shorter and longer sizes of arrow glyphs

SHORTER DOUBLE-UP movement

LONGER DOUBLE-UP movement

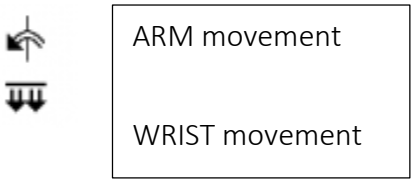
Bianchini (2012) noted that in the ISWA 2010 there is not a regular system of longer and shorter arrows, and that some arrows skip a size. She recommended that this lack of symmetry is solved by adding the missing arrow glyphs. For instance, in the ISWA 2010 there are four arrow lengths available for straight movement forward, however there are only three arrow lengths for corner movement (See Figure 2.18). Bianchini (2012) suggested that the missing corner movement arrows is added and that the same is done for all missing arrows in the system.

Figure 2. 15: SW irregular sizing possibilities in ISWA noted by Bianchini (2012)



The ISWA 2010 also contains glyphs to represent the movement of the arms or wrists (axial movement) (Figure 2.19):

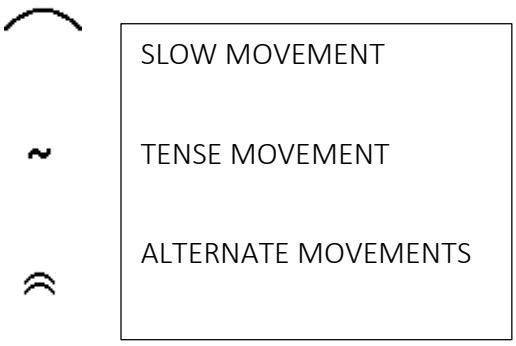
Figure 2. 16: Axial Movement glyphs



2.7.3 SW Dynamics and Timing Glyphs

The glyphs found in this category represent the dynamics of movement. Some of the glyphs of this category can be seen in Figure 2.20.

Figure 2. 17: SW dynamic glyphs.



See Appendix B for the full list of glyphs found in Group 21.

2.7.4 SW Head and Face

Glyphs that represent the head and facial expressions fall under this category. A few examples can be seen in Figure 2.21.

Figure 2. 18: Head glyphs with further glyphs representing the 'smile' 'eyebrows-up' and air puffed out


HEAD WITH A SMILE


HEAD WITH EYEBROWS RAISED


HEAD WITH AIR PUFFED OUT OF MOUTH

Groups 22-26 contain the full list of ISWA 2010 glyphs for head and face articulators and can be found in Appendix B.

2.7.5 SW Body Glyphs

SW Category 5 consists of glyphs that represent areas of the body. Group 27 consists of a number of glyphs that represent the trunk area of the body. Group 28 consists of glyphs that represent the limbs of the body (see Appendix B). The most commonly used for the writing of LSM is the shoulder glyph:

2.7.6 SW Detailed Location Glyphs

SW Category 6 consists of glyphs that are not used in writing, but rather as Sutton (2011, p. 20) states: "The symbols in Category 6 are only used in computer software to assist in giving further details for sorting large sign language dictionaries that are

sorted by SignWriting symbols." The following glyph  is a Detailed Symbol from the ISWA 2010 showing a more precise location of signing.

Bianchini (2012, p. 243) also describes Detailed Symbol Glyphs as un-used and unnecessary for writing Italian Sign Language (LIS). Bianchini described them as different from all other SW glyph since they do not have the same relative size as the other SW glyphs and therefore cannot be used as a base to add others SW glyphs such as hand configuration or movement. Detailed Symbol glyphs break the analogical relation between signing space and SW space (Bianchini, personal communication, September 15, 2012).

2.7.7 SW Punctuation Glyphs

Punctuation is a set of "rules for graphically structuring written language by means of a set of conventional marks such as dots and horizontal, vertical or oblique strokes" (Coulmas, 1999, p. 421).

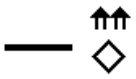
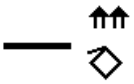
Research into the prosody of sign language (cf. Brentari & Crossley, 2002; Crasborn, Van der Kooij & Ros, 2012; Dachkovsky & Sandler, 2009; Hermann, 2010; Nespor & Sandler, 1999; Sze, 2009; Wilbur, 2001) may indicate what and how prosodic patterns of a given sign language are best represented in writing. For instance research may indicate which pauses, stops, intonation patterns are linguistically significant and which require representation in the written language by graphemes or other markers in the text. See also Section 6.8 for analysis of prosodic markers for the writing of LSM.

2.8 THIESSEN (2011) AND RULES OF SW

Thiessen's (2011) work is called a 'grammar of SW'. Thiessen investigates the rules that determine how SW glyphs combine together to form SW signs. A summary of some of his findings are presented here.

Thiessen describes SW glyphs as 'iconic' glyphs. He analyses the SW glyph-set and finds that SW has a lot of redundancy. He examines the horizontal and vertical planes of SW where handshape glyphs can be placed and notices that the two planes intersect at one point so that there are two handshape glyph forms that represent the same handshape. For example the B-hand palm facing down can be written either as  and  . These different glyphs represent the same position, rotation an orientation of the B-handshape. Thiessen coins the term 'synographs' (p. 22) to refer to these glyphs. Thiessen (2011, p. 25, p. 106) says that the writing convention for synographs is to use the 'simpler' glyph. A glyph that is not dis-jointed is considered simpler, thus the B-Handshape  is preferred over the  . 'Synographs' are a result of an additional plane in SW (Section 2.5), the 'Side' plane (Thiessen (2011, p. 21).

Thiessen (2011, p. 26) also talks of 'homographs'. These are visually identical but represent distinct hand orientations. For instance the B-hand without the thumb showing could represent either the dominant or the non-dominant hand  . This is where the use of arrows marked for dominant or non-dominant hand movement comes in useful.

One example of a homograph in the LSM texts is the use of the closed-fist without any thumb showing. Not only is this glyph ambiguous as to whether a right or left hand is represented, however additionally without the thumb showing, the rotation of the hand is impossible to determine, e.g. BASKET (BAG) (LSM) can be written as  however the orientation of the hand can only be identified when the following handshape glyph showing the thumb is used:  .

Another concept Thiessen (2011, p. 28) discusses in relation to SW is the issue of 'opacity'. Sometimes when one glyph is placed on top of another it covers the glyph beneath it and makes the other unclear or invisible e.g. FEKRUNA (TURTLE) (LSM)  . In order to write the glyphs clearly the glyphs need to be placed near each other rather than on top of each other as in  . Another possible spelling could be a sideway view as in  .

Thiessen (2011) also notes that Sutton uses the concept of 'rootshapes' to describe basic forms of SW handshape glyphs. The rootshape is determined by the lowest finger in the handshape. Once this is determined fingers known as 'Action Fingers' are attached to it.

Thiessen (2011) uses the term 'exemplar' to refer to the specific handshape that is independent of its palm orientation or handedness. An exemplar consists of the base

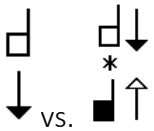
form plus the action fingers involved. On the basis of this identification, Thiessen (2001, p. 34) re-organized the handshape glyphs into three main base forms: the Fist, the Palm and the Cup. This new categorization is not adopted in this work.

Thiessen (2011, p. 73) says "Any application of SignWriting to a specific language should analyse that language's inventory of handshapes to see which handshapes are truly necessary and which are not." In this work an attempt to arrive at an inventory of truly necessary handshape glyphs is carried out in Chapter 8.

Redundancy of SW glyphs is also discussed by Thiessen (2011, p. 114) who argues that "The question is whether (…) redundancy is helpful for visual clarity or whether it creates an unnecessary proliferation of symbols that can confuse writers and readers". Thiessen argues for the inclusion of a minimal amount of glyphs that are enough for the reader to access the intended sign (Thiessen, 2011, p. 186).

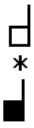
Thiessen (2011) also talks of the use of the tense glyph  in ASL spellings that marks classifiers or non-dominant hand holds called 'buoys' (p. 209). In the LSM texts this glyph was not used for this function and it is recommended for use in Section 11.2.15, to disambiguate between similar SW LSM signs.

Thiessen (2011) also talks about the interaction between glyphs. Hands are generally placed near the arrow glyph head or tail. However he notes that the placement of the arrow glyphs shifts when other glyphs are used in spellings. For instance when one handshape and a movement glyph are written the positioning of

the glyphs in relation to each other may be different than when two handshape glyphs are used in the spelling, e.g.  vs. .

Thiessen (2011) talks of fingerspelling in SW he notes that the norm is horizontal rather than vertical, however he adds that some are experimenting with vertical fingerspellings are being carried out. In the LSM texts fingerspelling is always written vertically and never horizontally.

2.9 TWO BASIC SW RULES

There are two rules for writing SW that are considered to be basic and are encouraged to be followed. The first rule states that the contact position needs to be written. Therefore writers are encouraged to write this SW sign  as  .

The second spelling rule states that the centre of the sign needs to be written. The centre is described as follows: “Every sign has a Center, like a little universe (…) (that) gives the sign focus for the reader. It is like an Anchor that grabs your attention.”[19] (Sutton, 2008 Guidelines). The contact position is described as the centre of the sign and for signs that do not have contact then the beginning of the sign is the centre.[20]

[19] http://www.signwriting.org/lessons/elessons/less064.html
[20] http://www.signwriting.org/archive/docs6/sw0534-SignSpellingGuidelines-2008.pdf.

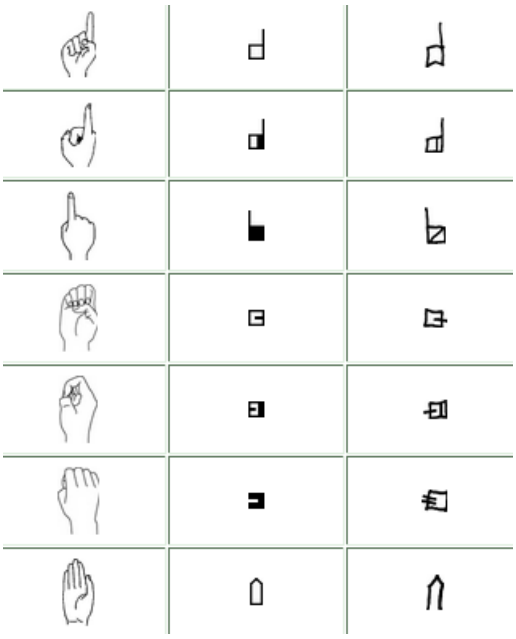
In Section 10.11 it argued that the guideline cannot always be followed, since when writing LSM the preferred written representation is the initial position of the hands, irrespective of whether they are in contact or not. If the hands are in contact then the contact position is shown by the positioning of the glyphs are written so in the first syllable, if they are not in contact then the preferred position is the neutral space where they start before they move to their contact position.

2.10 SW HANDWRITING

SW can be handwritten. Usually the first step is to learn to write SW by hand. In the website www.signwriting.org several pages are dedicated to the teaching of handwriting. These can be found at http://www.signwriting.org/lessons/cursive/handwriting/ . These handwriting lessons teach how SW can be written with less strokes of the pen/pencil (see Figure 2.22).

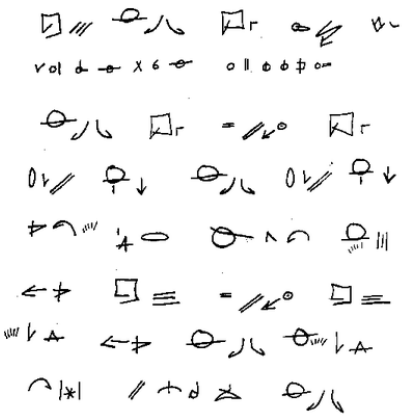
Figure 2. 19: Sample of a lesson teaching handwriting with less pencil strokes. Reproduced with permission from Valerie Sutton

http://www.signwriting.org/lessons/cursive/handwriting/symbols.html



There is also a shorthand system that developed in the 1980s and was called "stenography" (see Figure 2.23). Tests at the time proved that this system worked well; however with the development of computers over time, it became less used.

Figure 2. 20: A sample of SignWriting shorthand that developed in the 1980s and was known as "stenography"



In 1997 a fast system of handwriting was re-introduced however this time it was known as ‘cursive SW’;’

> It stems from the old SignWriting Shorthand, which is slowly changing from a "stenography system" for professionals, into a "cursive handwriting" for daily use. (...) Of course, just as with writing English, one must learn to "print block letters" before one learns to write cursively. So the Cursive SignWriting manual will be useful for skilled writers. (Sutton, no date, http://www.signwriting.org/library/history/hist008.html).

A sample of this handwriting can be seen in Figure 2.24.

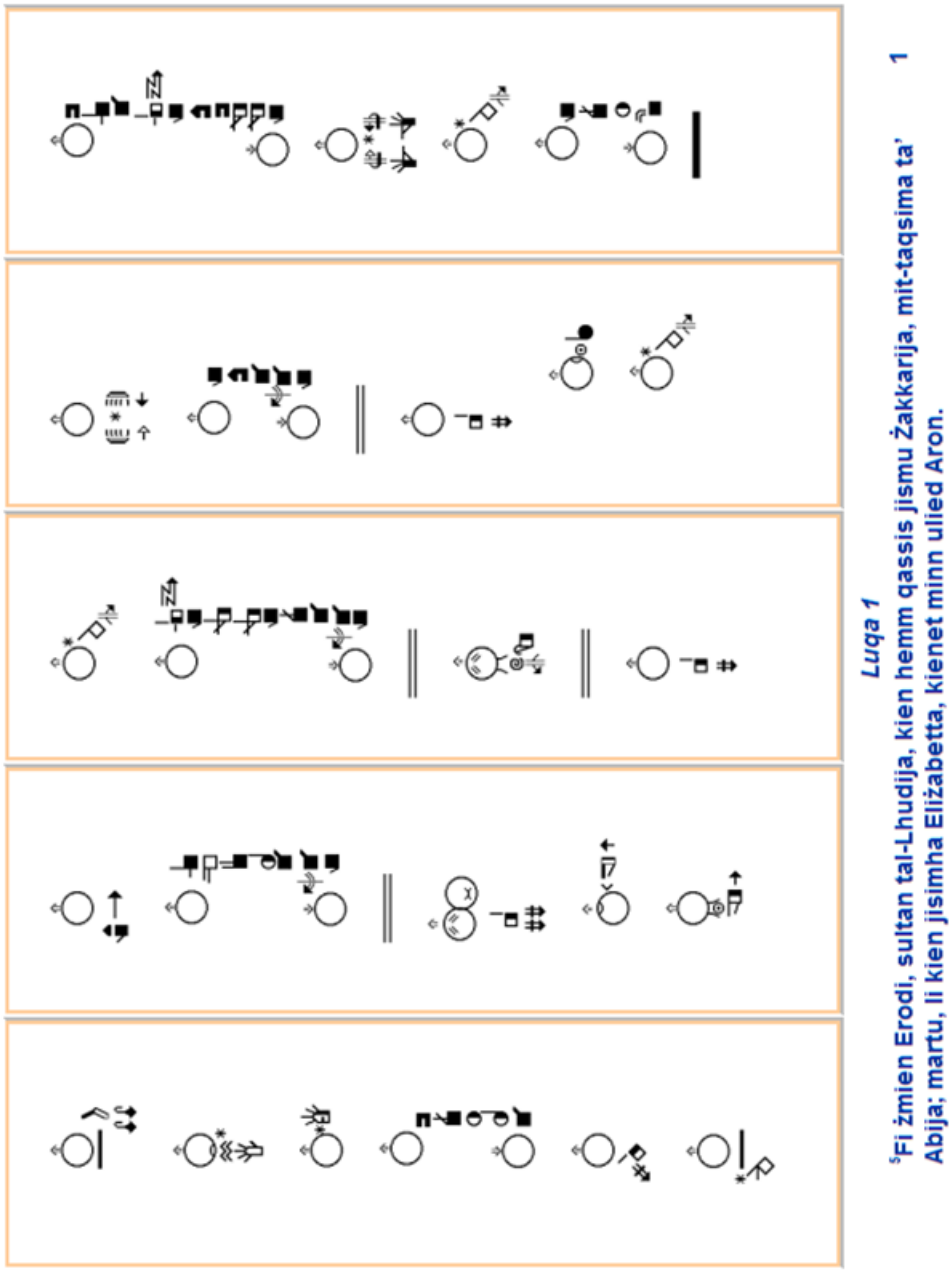
Figure 2. 21 Sample of cursive SignWriting produced in 1997. Image reproduced here with full permission from Valerie Sutton, from http://www.signwriting.org/library/history/hist008.html

2.11 SW: SPACE ON PAPER

SW takes up more physical space on paper (or graphical screen) (Bergeron, 2004, p. 133). It is evident from the work of the Christmas Stories (Galea, 2008) and other stories written in LSM, that SW physically takes up more space on paper (see Figure 2.25). As can be seen in the excerpt from Galea (2008, p. 1) what fits in just two lines in written Maltese takes up a whole page in SW LSM.

In the reading-questionnaire used in this study (see Section 5.5) some Deaf participants commented about this. Participants 1, 8 and 9 commented that the horizontal layout offered an advantage over the vertical layout since it is more economical with regards to physical space on paper.

Figure 2. 22: Excerpt of a page of SW LSM text with translation in written Maltese provided at the bottom



2.10 CONCLUSION

This chapter has presented the basics of SW in order to facilitate with the reading of the dissertation, especially for those unfamiliar with SW. Basic SW concepts such as

the expressive vs. receptive viewpoints and the handshape orientation were described.

The seven categories of SW were outlined, with the full list of Groups of SW available for reference in Appendix B. Thiessen's (2011) work on the rules governing the positioning of SW glyphs to form SW signs was overviewed in Section 2.8. The two basic SW rules recommended for the writing of SW were described in Section 2.9. Handwritten SW was described in Section 2.10 and in Section 2.11 the issue about the amount of physical space required for SW was outlined.

CHAPTER 3: LITERATURE REVIEW: WRITING & ORTHOGRAPHY

3.1 INTRODUCTION

This chapter reviews literature from three related areas. Section 3.2 distinguishes between writing systems and orthographies. In Sections 3.3-3.5 different writing systems are reviewed and a discussion on which classification best suits SW is carried out in Section 3.6. It is argued that SW is a featural system (Section 3.6) but with a difference. Section 3.7 reviews notations for sign languages. The activities of reading and writing also come into play and these cognitive activities are overviewed in Sections 3.10. Works carried out regarding the development of SW into an orthography are reviewed in Sections 3.8 and Section 3.9 reviews SW in fields other than linguistics.

Work related to the development of an orthography for LSM involves the understanding of the grammar of spatial-gestural languages - literature concerning this area is carried out in Chapter 4.

This chapter concludes with the research questions that are derived from the literature review carried out in this chapter (Section 3.11). Further research questions are derived from the literature reviewed in Chapter 4.

3.2 WRITING SYSTEMS AND ORTHOGRAPHY

In this section the difference between a writing system and an orthography is outlined. The ISWA (2010) is a writing system, however, when applied to the writing of a sign language such as LSM, the writing system becomes an orthography.

3.2.1 Definition of writing

The term 'writing' is used in this work to refer to "a system of recording language by means of visible or tactile marks" (Coulmas, 2003, p. 1). Writing is also referred to in this work to describe "the activity of putting such a system to use" (Coulmas, 2003, p. 1).

Writing is also defined by what it is not. In the typology of writing systems it is generally agreed that isolated pictograms and petroglyphs are not considered to be part of writing, since they do not have a "stable, conventional relationship with language" (Coulmas, 1999, p. 520).

Although the term 'pictograms' is sometimes used to talk of written systems such as Chinese and Sumerian (Coulmas, 1999, p. 407), the term is not used here in this sense. Rather 'pictograms' as used here, such as the public toilet signs for Gents and Ladies pictograms and several traffic symbols have no mapping to language.

Petroglyphs are engravings in stone and are classified as 'pictograms' here. They are very often prehistoric carved or painted signs and are not writing proper. (Coulmas, 1999, p. 393). Prehistoric cave drawings are one example of petroglyphs.

Coulmas (1989, p. 38-39) provides a clarification between the terms 'writing system', and 'script' and these distinctions have been adopted by Jaffre' and Fayol (1997). Coulmas' definitions are adopted for this work.

A 'writing system', as used in this work, is defined as "a set of visible or tactile signs used to represent units of language in systematic ways, with the purpose of recording messages which can be retrieved by everyone who knows the language in question"(Coulmas, 1999, p. 506).

A 'script' refers to the graphic form of the units of a writing system (Coulmas, 1989). For instance Maltese and Arabic share similar writing systems (alphabets) but they employ different scripts, the Roman alphabet and Arabic script respectively.

Gelb's (1963, p. 12) definition of a writing system as a vehicle of speech is useful here since he places emphasis on the human intercommunication aspect of writing. The human communication that occurs in writing distinguishes between a writing system and a notation. Perception, acceptance and use determine whether a system is truly a writing system or not (Coulmas, 2009).

3.2.2 Defining 'Orthography'

The term 'orthography' usually refers to a set of rules that regulate the use of a writing system for a specific language, with the defining feature that the symbols and the rules are standard and codified (Seifart, 2006, p. 277). For instance, the English orthography employs the Latin alphabet, yet unlike other languages it uses <ph> and <f> for [f] and <k> and <c> for [k]. Also the Maltese orthography uses a <b> for word-final [p].

The orthography of LSM is not yet a standard form, however since SW is being used for the writing of LSM, the orthography is being developed. In Chapters 6 and 7 the LSM orthography that has used SW is analysed. Thus in this work 'orthography' is used to refer to the language choices made when writing systems (such as SW) is used by a specific language, irrespective of how long the writing system has been used. Once the writing system is put to use, the choices made mark the beginning of the development of an orthography.

Jaffe (2000) wrote an article about non-standard orthography and non-standard speech and from his observations about non-standard orthography, he comes up with the following definition of orthography:

> Orthographies are in themselves selective representations of the meanings of linguistic differences and similarities; the selection process makes statements about the status and relationship between languages, language varieties and their speakers. (p. 502).

Thus a study of the developing non-standard orthography of LSM should make statements about the language itself, since the selections made when writing reveal information about the language, LSM.

3.2.3 The merits of a standard orthography

In his article, Coulmas (2009) discusses the evolution of writing systems. He lists a set of criteria that determine whether a writing system evolves into a fully standard orthography or not. Coulmas (2009, p. 14) notes that a merit of script is explained not in terms of instrumental utility but also on the merits of achievement of certain

goals. There are several merits that are assigned to a script. These include the following: 1) that the script is both convenient for the writer and the reader; 2) that the script may be produced fast and by using simple implements, 3) that the script fits linguistically with the nature of the language; 4) that it has expressive power; 5) that it remains stable through time. Coulmas concludes that there is no writing system that achieves all these goals.

In the planning stages of orthography for a specific language a balance needs to be reached between the convenience for the reader and the writer:

> (A) good writing system/script/orthography must be convenient for both the reader and the writer. However, in reality, these are two separate criteria, which must be balanced. Maximizing graphic discrimination is good for the reader but cumbersome for the writer, with implications on all three levels of script, system, and spelling conventions. (Coulmas, 2009, p. 9)

This work does not investigate whether the actual writing of SW is cumbersome. The feedback received from the Deaf participants concerns the reading rather than the writing of LSM (see also Section 3.10).

3.2.4 Native speakers' choice of orthography for their own language

Although linguistic planning can and has been applied to the creation and reformation of writing systems, the planning stage is not necessary for the evolution of a standard orthography. What accounts for acceptance or rejection of an orthography is the language community's attitude towards it: "socio-linguistic

factors weigh heavier than systemic factors in determining how communities choose their writing systems, scripts, and orthographies" (Coulmas, 2009, p. 9). Any linguistic skill applied to the orthography is often overruled by inertia and other factors that block the road for its development:

> Moreover, once a writing system, an orthography and a script have received official blessing and are subject to institutional support, functional criteria are often overruled by inertia and an interest in stability which may block the road towards future improvement for a long time, if not permanently. Writing systems are not just technologies, but also emblems of identity, and as such interfere with the rationality of utility. (Coulmas, 2009, p. 15)

Attitudes of native speakers often affect the choice of orthography (Jaffe, 2000, p. 504). Speakers of a Mississippi regional dialect did not wish to adopt the English orthography but wanted their writing to look different and resemble the way they talk.

In the evolution of SW into a standard orthography, native signers also have strong opinions about what should or should not be included in the SW representation of their language. For instance Hoffmann-Dilloway (2011, p.354) notes that a Deaf person's attitude towards SW is positive when this person remarks that SW can capture nuances of that person's language and reflects the way it is signed.

In the methodology of this work, Deaf participation was considered to be an integral and important aspect of the study (see Section 5.5).

3.2.5 Adopting a writing system: three-step development

When the Japanese adopted the writing system of Chinese to write their language, the Chinese writing system was fully developed (Coulmas, 2003, p. 169). Japanese scribes faced the task of adjusting the Chinese writing system to make it possible to read their native language. Initially it is no easy task to separate a language from its script (Coulmas, 2003, p. 168).

The graphical shapes of the Chinese characters were gradually changed to represent language units of Japanese i.e. syllables. Coulmas (2003, p. 179-180) describes three mechanisms that are involved in this process: 1) the graphs of a different language are reinterpreted; 2) the graphs are used for phonetic interpretation only, 3) the graphs are modified or new ones created and modelled on the adopted system.

Although it is a very different scenario, in the evolution of SW a similar three-phase pattern can be observed. When SW evolved from DanceWriting, the sign language that influenced the development of SW was ASL. The SW default categorization of the handshape glyphs clearly mirrors the natural categorization of ASL handshapes.

Despite the rules of SW (Thiessen, 2011) when the SW glyphs are adopted by individual languages the glyphs and rules are often reinterpreted. For instance using the ISWA glyph-set the LSM sign ĦU/BROTHER was spelt like this:  When the inventor of SW saw the spelling together with the video accompanying it, she pointed out that the handshape glyph adopted did not precisely represent the actual handshape. However this happens naturally and is in no way problematic. When SW is used as an orthography, with language-specific rules for writing, all readers of a

language will read the handshape glyph in the same way, irrespective of the original intended handshape of the ISWA 2010.

The second mechanism of using the glyphs for phonetic writing only can be observed in many of the email discussions on how to write certain articulations of signing, rather than the writing of the language. Usually this mechanism occurs prior to the next one.

The third phase is usually the last one, and this involves the remodelling of glyphs according to need. This mechanism for SW can be seen in the recent work of Bianchini (2012) and in this work. Bianchini (2012) recognised that for writing LIS the addition of new glyphs would be needed to have a more systematic and regular writing system (see more in Section 3.8.6).

3.3 TYPOLOGY OF WRITING SYSTEMS

Traditionally writing systems are classified into logographic, syllabic and alphabetic systems (cf. Coulmas, 2003). There are different types of classifications of writing systems because researchers have different theoretical goals and definitions (Coulmas, 1999, p. 521). Different classifications are found also because the linguistic units of the different writing systems under investigation allow for different classification because writing systems "rarely embody a specific type in its pure form" (Coulmas, 1999, p. 521) but rather they are mixed.

3.3.1 Mainly Mixed Writing Systems

The Han'gul system is one of the most consistent writing systems. Each graphical unit consistently represents the same linguistic unit, the syllable (see also Section 3.5.2). Most writing systems are much less consistent and rely on various mapping relationships (Coulmas, 2003 p. 169). The reason for the mixing found in many writing systems is due to historical changes. Features of earlier stages are retained and new features added to the writing system and the mapping relation becomes more complicated (Coulmas, 2003).

Another example of a mixed system is English (Stubbs, 1996). Although English appears to have a defining unit, i.e. one class of symbols, the alphabet, this is deceiving. The analysis of the English orthography fails if it is assumed that individual letters represent sounds in a uniform manner (Coulmas, 2003, p. 183) (see also Section 3.5.3). There are several combinations of letters that are units and a long list of rules for their interpretation. Sometimes these rules are in opposition with one another. When all rules are exhausted a list of unpredictable spellings remains.

The reason for this is the multifaceted history of English writing (Scragg, 1974). Generally once spellings are conventionalized they are more resistant to change than speech, thus written words tend to be autonomous whereas the phonetic interpretation is adjusted with time. The English letter <a> has eleven sound interpretations and does not consistently mark one phoneme of English, but rather different phonemes in different contexts.

No one writing system fits 'perfectly' into one of the major classifications of writing systems (Coulmas, 1999; DeFrancis, 1989; Gelb, 1963; Joyce, 2013). However Joyce (2013) points to the usefulness in identifying the dominant principle of a writing system, since "the distinctions we utilize in differentiating systems may be as informative as possible about how different writing systems function in representing language". (p. 66)

A more general classification proposed for the typology of writing systems is the distinction between pleremic and cenemic systems. 'Pleremic' systems are writing systems that contain both a phonological and a semantic element. Chinese and Sumerian writing systems are classified as pleremic. The term 'non-phonographic' writing system is used by Joyce and Borgwaldt (2011, p. 5) (see also Section 3.4)

When a writing system contains only a phonological representation it is known as a 'cenemic' system. Joyce and Borgwaldt (2011, p. 5) use the term 'phonographic system'. The written languages of English and Maltese that employ an alphabetic system (see Section 3.5.3) are labelled cenemic systems.

Phonographic vs. non-phonographic writing systems are reviewed in light of the attempt to classify SW. Understanding the classification of SW has merit because it provides information about how this writing system functions in representing sign language.

3.4 NON-PHONOGRAPHIC SYSTEMS

Non-phonographic writing systems have been traditionally classified as 'logographies' or 'ideographies'. Recently the term 'morphographic' is substituting these less accurate terms (cf. Joyce, 2013).

In the traditional sense the basic unit of a 'logography' is the word (the *logo)*. However the words of a language are an open-set, therefore there is no writing system that could contain every word (Coulmas, 2003, p. 60).

Sumerian and Chinese are often classified as logographic systems, since both Chinese and Sumerian characters grew out of drawings of objects that represent words (Coulmas, 2003, p. 50). Perfetti (2003, p. 3) however, talks of two language constraints of writing. A writing system is not a parallel language system, and does not encode meanings directly in the same way that language does. Secondly, reading a writing system involves reading the sounds of the language. According to these language constraints there are no 'pure' logographic systems. The idea that Chinese is a fully logographic system is misleading and based on misconceptions of the writing system (Perfetti, 2003, p.7).

Logographic systems are also called 'ideographic systems' but this term is misleading since it implies that the graphical unit represents an idea (Coulmas, 2003, p. 59). Chinese characters are misconceived as 'ideograms' and Unger (1990) explains that the misconception comes from the West rather than being a native perspective in China.

In the past, the basic unit of the writing systems classified as logographs was thought to be the 'word'. Today it is understood that the basic unit is best described as a 'morpheme'. On the basis of this Joyce (2013) explains that the term 'logographic' is inappropriate and argues that it should no longer be used. He proposes that the term 'morphographic' should replace it:

> (..)The tradition of using the term logographic, while simultaneously acknowledging that morphographic is *more precise* (Daniels 1996a, 2001; Fischer 2001; Halliday, 1985; Kess & Miyamoto 1999; Sampson 1985; Taylor 1988; see also entry in Coulmas 1996a), is surely one that does us no service at all, and, therefore, should be abandoned. (p. 73).

The Chinese writing system has been classified as both 'logographic' and 'ideographic' because a semantic aspect of the writing systems was identified. Despite this semantic aspect, phonetic symbols are used and are necessary for successful reading of the writing system. Over the centuries Chinese has developed 50,000 semantic and phonetic symbols called radicals (Coulmas, 2003, p. 60). These radicals are indispensable (DeFrancis, 1989; Perfetti, 2003; Shu, 2003; Shu, Anderson, & Wu, 2000; Shu & Wu, 2006). It is today understood that "systematically and functionally the Chinese writing system relies more on sound than on meaning." (Coulmas, 2003, p. 57).

Further evidence for this can be found in studies related to the acquisition of literacy skills in Chinese. Shu (2003) found that children map sounds of the Chinese language

to the graphical symbols. Shu, Anderson, & Wu (2000) show that understanding the phonological-orthography relationship is crucial for the acquisition of Chinese characters in children.

> Just like children learning alphabetic scripts, Chinese children, besides phonological knowledge about specific characters stored in memory, also acquire general knowledge of orthography–phonology correspondences (OPC) in naming performance of Chinese characters. The insight that a compound character consists of components in which the phonetic provides sound information is an important step for the development of reading skills in Chinese children. (Shu & Wu, 2006, p. 112).

Other terms used to describe the Chinese writing system are 'morphosyllabic' and 'semanto-phonetic' (www.omniglot.com) writing systems: "It is now widely recognized that the Chinese writing system is best described as a large syllabary with strong semantic elements that make up for the phonetic imprecision." (Coulmas, 2003, p. 57).

Since the Chinese writing system is a mixed semantic and phonetic system it is defined as a pleremic system.

3.5 PHONOGRAPHIC SYSTEMS

A phonographic or cenemic system is defined as a writing system that contains only a phonological aspect. Traditionally syllabaries and alphabetic systems fall under this

category. Van der Hulst and Channon (2010, p. 15) also talk of a featural system as a phonographic writing system.

3.5.1 A syllabary and economical writing

In a syllabary the basic unit represented is a syllable. In the field of phonology a syllable is understood to be a unit of sequential speech sounds, a unit of the language's metrical system (Laver, 1994). The syllable is a psychological reality for speakers (Kubozono, 1989; Schane, Tranel, & Lane, 1975). Different languages allow for different syllable structures. These different syllable structures are part of the phonological system of the language. To summarize the syllable requires a nucleus that is usually a vowel (V). The syllable has optional initial and final margins that are usually consonants (C) (Coulmas, 2003, p. 63). Additionally, stress, duration and tone may be assigned to the syllable. Whether these are distinctive varies across languages (Coulmas, 2003, p. 65).

Many languages employ the syllable as the basic unit of their writing system. Whether this is suitable or not depends on the syllable structure of the language (Coulmas, 2003, p 87). German and English are considered to have extremely complex syllable systems and therefore it is unthinkable that these languages may develop a syllabary. On the other hand Chinese and Fijian have relatively simple syllable structures and so it is more likely for these languages to develop a syllabary for their writing system.

There is no syllabary where each graph represents a distinctive syllable. The Aegean systems contain only a few dozen graphs to represent the syllables of the language,

however the writing of these languages are often difficult to interpret. The modern standard Yi system consists of 800 graphs to represent syllables and this is more than is necessary to write the language, resulting in an uneconomical system (Coulmas, 2003, p. 87).

3.5.2 Featural systems: Han'gul and SW

Han'gul is a featural system and has been compared to SW (Martin, 2004; Van Der Hulst & Channon, 2010). Han'gul's basic letter shapes and their arrangements into syllable blocks represent the different places of articulation (Coulmas, 2003, p. 157) and likewise each glyph of SW represents a feature of articulation (see Chapter 2).

Han'gul is claimed to be the only featural writing system in the world (Kim, 1997, p. 150), however SW is clearly a featural system also. There are significant differences between Han'gul and SW, and this is due to the difference in modality. Han'gul has 12 glyphs representing features of articulation (Kim, 1997, p. 149) while SW represents 652 glyphs to represent all the visible properties of visual-gestural languages (see Section 2.6). Hangul is far from transparent unlike SW that is highly transparent (Van der Hulst and Channon, 2010).

It must also be noted that Han'gul is a system that has been created to write one specific language, Korean, whereas SW is a writing system that can write any sign language in the world, and this naturally leads to a larger amount of glyphs in order to represent all possible features of articulation for all sign languages.

Another difference between Han'gul and SW is that when the features of Han'gul are combined they result in a syllable-block (Kim, 1997). However when the SW feature-

glyphs are combined together the result in a SW sign, that is at the level of at least one morpheme and possibly more.

Furthermore SW differs from Han'gul because the glyphs that represent features of articulation may also carry subtle visible meanings (see Section 4.2.3). Thus unlike Han'gul it may be argued that SW does contain a semantic element, although the line between SW glyphs being phonographic and non-phonographic is very thin, and this is due to the nature of sign language that is iconic even at the phonetic level (see Section 4.2.1). SW glyphs are iconic of the features of articulation, however the features themselves are at times iconic (and contain inherent meanings) and thus the SW glyphs also contain these inherent iconic meanings. Van der Hulst and Channon (2010, p. 157) also noted this: "it appears that SignWriting is iconic of the semantic meaning because of the transitive nature of phonographs." This uniqueness of SW as a writing system creates a challenge for the classification of SW as a writing system.

3.5.3 Alphabetic Writing Systems

In an alphabet, the basic unit represented is the segment. It is commonly believed that alphabetic letters encode phonemic segments. Cohn (2001) has found evidence for the psychological reality of segments. On the other hand Morais, Cary, Alegria and Bertelson (1979) argue that segments are simply mental projections. Both findings question the relationship between encoding speech as a sequence of discrete graphical units and the mental representation of these units. Illiterate

adults are unable to divide the stream of speech into segments, however, with a little reading instruction are then able to do so (Coulmas, 2003, p. 90).

Letters of the alphabet are often interpreted as the segments of the language (Coulmas, 2003). Phonologists define a segment as a group of distinctive features referring to characteristics of its articulation (Laver, 1994). These features are the cornerstone of phonological theory. Their combinations yield distinctive sound segments. The IPA (International Phonetic Alphabet) is a system used to encode the phonetics of spoken languages.

SW can be used to write any sign language. SW is thus a phonetic system that contains enough glyphs to write all possible articulations that occur in sign languages: all handshape configurations, movements of hands and facial expressions (see Chapter 2 for more detail). SW is like the IPA of sign languages. Its full name is the ISWA, i.e. International SignWriting Alphabet.

The IPA is referred to as a notation used for the transcription not the writing of a language, however as its name implies it is also an alphabet, since the basic unit of this system represents a segment. SW can and is used as a notation, but it is also used as a writing system (see also Section 3.7.7).

Taking the International Phonetic Alphabet (IPA) as an example, this system is not perceived, accepted or used by any community that shares a common language to be a writing system for its language. The IPA is a notation used to transcribe the phonetics of different languages for linguistic analysis. It is not used for the writing

of literary texts or self-expression. The use of the IPA marks it as a notation and not a writing system.

3.5.4 Shallow vs. Deep Orthographies

The 'grapheme' is defined in Section 2.3.3. In alphabets of specific languages, the grapheme may consist of more than one letter. For instance in English the phoneme /u: / is represented by the following (underlined) letters or sequences of letters*:* *tr<u>u</u>ly, d<u>o</u>, sh<u>oe</u>, s<u>oo</u>n, tr<u>ue</u>, lawsu<u>i</u>t, t<u>wo</u>, r<u>ou</u>tine, scr<u>ew</u>ed, j<u>ewe</u>l, man<u>oeu</u>vre, rendezv<u>ous</u>, thr<u>ough</u>out, c<u>ou</u>ps* (taken from Coulmas, 2003, p. 99). In English it is impossible to create an algorithm of phoneme-grapheme correspondences. This is because English does not operate simply on a phonemic interpretation of the individual letters however on the basis of a higher-level such as morphemes and occasionally words.

Written languages such as English and French are referred to as 'deep' orthographies. Written languages such as Finnish and Spanish on the other hand are 'shallow' orthographies since there is a much closer link between the grapheme and the phoneme. Shallow orthographies are considered simpler to deep orthographies.

English spellings rarely have a one-to-one correspondence with a specific phoneme. For instance the central vowel schwa [ᵊ] is encoded by every letter that represents a vowel in English, thus the same sound is written with : <a> *about*, <e> *rebel*, <i>*compatible*, <o>*oblige* and <u>*circus* (Coulmas, 2003, p. 96).

There are several reasons for the polyvalence in the Latin letters within a specific language and across languages and the multiple sounds that have been assigned to

the different letters of the Latin script. Coulmas (2003) describes three main reasons – historical, systematic and haphazard reasons.

When a language with a different phonological inventory adopts the Latin script it assigns different phonemes to the different letters of the Latin alphabet. Each language uses the letters of the Latin script for the purpose of writing that specific language. It is natural that the original Latin phonemes that were assigned to the letters of the Latin script are not adopted. Having said that, many words that are part of the English vocabulary were adopted from Latin and were pronounced as they were spelt. With time the gap between the pronunciation and the spelling widens (Coulmas 2003, pp. 96-97). This is just one example of how polyvalence occurs in an orthography of a specific language.

3.5.4 Vowel incorporating alphabets

Consonantal alphabets (also known as 'abjads') are commonly used to write Semitic languages. In 'abjads' the consonants are represented by letters of the alphabet. However, vowels are not indicated. Vowel incorporating alphabets, such as the Brahmi script, represent vowels in the alphabet by modifying the shape of the grapheme that represents a consonant.

3.5.5 Phonemes and Graphemes

Phoneticians and phonologists recognised that the segment cannot be easily distinguished phonetically in a string of natural speech. Phones do not remain the same in articulated speech. The [t] in *time* is different from the [t] in *tree.* A phone does not occur in isolation but in continuous speech and it is influenced by sounds

that occur before and after it: “it is impossible to disarticulate phonological representation into a string of non-overlapping units” (Prince 1992, p. 386). Due to this physical reality of the ‘phone’, phonologists have come up with the notion of the ‘phoneme’. This can be considered as a mental representation of the minimal contrastive unit of sound of a particular language.

An alphabet is commonly interpreted as a list of phonemes of a language. An alphabet such as the Latin Roman alphabet is used for the writing of several different languages. The Latin alphabet contains 23 letters and its modern roman form has 26 letters: A B C D E F G H I J K L M N O P Q R S T U V W X Y. These letters of the roman script do not encode ‘phonemes’ since the roman script is used to write several languages, and the particular ‘phonemes’ are different in individual languages.

In the same way SW does not encode ‘phonemes’. This ISWA 2010 contains glyphs to write any sign language. The term used for the equivalent of a phoneme in the written form is a ‘grapheme’ (see Section 2.3.3). The SW as a system does not contain a list of graphemes. The term employed in this work to refer to the symbols of SW is ‘glyphs’ (see Section 2.3.2).

The Latin script is used to write several different languages. The letters of the Latin script have been assigned different sounds when adopted as graphemes for different languages. For instance, the letter <x> has been assigned at least eight different sounds for different languages (Coulmas, 2003, p. 95). The same kinds of patterns are expected to emerge for different sign language orthographies using SW. When an alphabet, such as the Roman alphabet is adopted for the writing of a specific

language, we talk of an 'orthography' rather than a writing system (see Section 3.2.2). Coulmas (2003, p. 91) claims that: "In a sense, alphabetic orthographies can be understood as descriptions of their respective languages." (p. 91).

3.5.6 Morpho-Phonemic spellings of an alphabet

DeFrancis (1989, pp. 184-185) talks about an important aspect of alphabetic systems, a device called 'morpho-phonemic spelling'. He outlines the three levels of sound representation phonetic, phonemic, and morpho-phonemic. In phonetic representations differences in meaningless sounds are notated.

Applying phonemic criteria for spelling the words results in the same symbol for <p> in *put* and *spot*. The phonetic reality of British English is that <*p*>in *put* is an aspirated-*p* [p^h], whereas it is not aspirated in <spot> so is transcribed as [p̃].

Although the [p^h] and [p̃] are phonetically distinct, the distinction is not phonemic since they are not contrasting units of sound in British English and do not result in a change of meaning if both occurrences of <*p*> were articulated in the same way.

Spelling at the morpho-phonemic level occurs when not only are the contrasting units of sounds of a specific language reflected in the graphical representation but furthermore the morphemes of a language are reflected by standardized uniform spellings regardless of whether the sounds of these morphemes physically change in context (DeFrancis, 1989, p. 185). For instance in English spelling nominal plurality is marked by graphical <*s*>, regardless of whether the phonetic sounds are [s] or [z] or [ɪz] in *cats* and *films* respectively and by <es> in *roses*.

3.6 CLASSIFICATION OF SW: A PHONOGRAPHIC SYSTEM

> There have been no known attempts to position a writing system that corresponds to a sign language within any classification scheme, and with the considerable amounts of semantic reference within signs would be a special challenge for existing typologies (Terry Joyce, personal communication, July 2013).

Since SW has only been seriously investigated for just over a decade with the works of Flood (2002), Abushaira (2007), Hoffmann (2008), Thiessen (2011), Hoffmann-Dilloway (2011; 2013) and Bianchini (2012), it is not surprising to find claims about writing systems that exclude the possibility of writing sign language. One such claim is: "There are several important aspects of reading that, so I claim, are interrelated by a central fact about literacy: Writing systems encode spoken language." (Perfetti, 2003, p. 3).

Some minimal reference to SW is introduced in these websites about writing systems and scripts www.omniglot.com and www.scriptsource.org. In both instances SW is classified as an alphabet. Additionally Martin (2005) classified SW as a particular type of alphabet known as an antalphabet (see Section 3.7.1).

Capovilla (2004) used SW in his dictionary of LIBRAS and he describes SW as an alphabet:

> Tal escrita não é ideográfica ou semantográfica, ou seja, não representa diretamente o significado. Em vez disso, parece-se mais com a escrita alfabética, uma vez que, assim como o alfabeto, mapeia

> as propriedades fonológicas (i.e., quirêmicas) da língua primária, nativa, da cultura a que pertence o escritor[21]. (p. 254)

Van der Hulst and Channon (2010) describe SW as a phonographic system:

> SignWriting might at first appear to be a (word- or morpheme-based) semagraphic system, but it is actually phonographic: the graphs depict aspects of the phonological form of signs. Wherever the phonological form is iconic of the semantic meaning, it appears that SignWriting is iconic of the semantic meaning because of the transitive nature of phonographs. (p.157)

Van der Hulst and Channon (2010) distinguish between an alphabetic system and a featural system. They describe SW as a featural system rather than an alphabetic system, where the phoneme is a result of a number of features represented in the SW form:

> If a writing system were featural and had iconic order, one could imagine representing the graphic feature units that jointly characterize a phoneme non-linearly in order to iconically capture their simultaneity. This is what happens in SignWriting (p. 164)

[21] Translation: "Such writing is not ideographic or semanto-graphic, ie. It does not directly represent the meaning. Instead, it looks more like alphabetic writing, since, like the alphabet, it maps phonological properties (ie, cheremic) of the native language as well as the culture of the writer." (Capovilla, 2004, p. 254)

Furthermore they provide an explanation as to why not only SW, but every known notational system of sign language represents the features. They argue that it "bears on a well known problem of sign language phonology: there is little consensus on either the existence or definition of the various phonological levels in sign language beyond the feature or feature class (such as handshape)" (Van der Hulst & Channon, 2010, p. 167).

3.6.1 SW: An alphabet or antalphabet?

Martin wrote a paper (2005) about terminology used in the field of SW. It is a paper used by other academics (cf. Hoffmann-Dilloway). Martin's argument is that SW may be described as an 'antalphabet', a term adopted from Otto Jesperson in 1889.

Jesperson described a type of script that contains graphemes that represent the articulation of speech, for example a grapheme that would iconically show the lip rounding in the sound <u> that occurs during speech articulation. The Korean Han'gul script has features in it that may be seen to be antalphabetic (Section 3.5.2). However not all of Han'gul is antalphabetic in this sense, since it contains a set of symbols that do not represent the articulation of speech.

Martin's (2005) paper is lacking however in two claims. His first claim is as follows: "SignWriting is an antalphabet that shows us the phonology of signed languages in just the same way as our alphabet shows us the phonology of speech." (Martin, 2005, last para). SW is not analogous to language-specific alphabets, since these have developed over time and may have become representative of the phonemes of that given language. Rather SW is analogous to a script, such as the Latin script, that

is used for several different languages. Thus the glyphs of SW do not represent phonemes but phones. Martin's definition can be rephrased as follows: 'SW is a notation that shows us the phones of signed languages in just the same way that a notation such as the IPA shows us the sounds of spoken human languages.'

Another problem with the paper is with the use of the terms syllable and segment. They are each not clearly defined and seem to be placed into the same category. As has been discussed in Sections 3.5.1 and Sections 3.5.3, the syllable and segment are different units in phonology.

Although the term 'antalphabet' does describe one use of SW, i.e. its use as a notation system (Section 3.7), this term does not reflect the full reality of SW's development into an orthography and thus will not be adopted in this work.

In this work SW as a general writing system is described as a featural system with a difference since it is highly transparent unlike Han'gul. The description of SW as a general system as featural is based on van der Hulst and Channon's arguments relating to the status of SW as a featural system rather than an alphabet (see Section 3.6).

However when SW is used for the writing of a specific language where the level of phoneme is represented by the glyphs (that could in such a case be called 'graphemes'), then the SW of that specific language may be referred to as an alphabet.

3.6.2 SW glyphs: What is truly necessary?

> With the writing of sign languages in its infancy, we still lack the experience to know what distinctions are truly necessary. Perhaps, these distinctions may be useful for a more phonetic transcription. But it is likely that everyday writers eventually will develop conventions for writing these symbols that might not use the full set of arrows. (Thiessen, 2011, p. 114)

The ISWA 2010 contains 652 BaseSymbol glyphs to write any sign language (see Chapter 2). Bianchini (2012) studied the glyph-set of the ISWA for the writing of LIS. She concluded that more glyphs were required in order to make the system more regular. For instance she noted that there was not a regular system for the sizing of arrow glyphs. Her Deaf participants claimed that they preferred having a more regular system.

Hoffmann-Dilloway (2011) refers to the inclusion of the smile glyph in SW which may be considered to be a paralinguistic property by linguists who may be influenced by the structural theory of language. She notes that despite this, the SW smile glyph may be considered to be a crucial element of writing sign language by the Deaf (see more in Section 8.8.2).

3.7 NOTATIONS FOR SIGN LANGUAGE

> Notations, unlike recordings, intentionally abstract away from the original linguistic events in ways not dictated by limitations of the

> recording process or “artistic license”, but by (more or less) systematic decisions to annotate or symbolize only some (discrete) elements of the original signal. In almost all cases, they are part of an analytic system of some kind, but they differ from each other in what they represent, how they do it, and their goals. (Van der Hulst & Channon, 2010, p. 151).

Van der Hulst and Channon (2010) distinguish between two types of notations: writing systems and transcriptions. They also describe coding systems that are created mainly for computer purposes. However, here only the distinction between transcriptions and writing systems is required.

A writing system has been discussed in Section 3.2. Van der Hulst and Channon (2010) describe a writing system as follows:

> A system used by the general population of literate speakers or signers of a language for the purpose of communicating and remembering the meaning of some linguistic event – a conversation, a contract, an order, a shopping list, a poem. (p. 153)

A ‘transcription system’ “seeks to accurately, unambiguously and rapidly notate language samples in a variety of media, ranging from paper and pencil, print to computer files so that they can be used as the basis for a more extensive analysis of the language and/or as illustrative examples.” (Van der Hulst & Channon, 2010, p. 153) SW is the first system to be perceived and named a ‘writing system’ for sign language, however SW has also been used for transcriptions.

There are other notations that have been used for transcriptions and Johnston and Crasborn (2006) note that a disadvantage in sign linguistic research is the fact that there is no one universal transcriptional notation used by all researchers, making cross-linguistic study strenuous.

All notation systems mentioned share in common that they are all featural systems (Van der Hulst & Channon, 2010).

3.7.1 The Bébian System

The first person known to carry out a written system for sign language was Bébian (1825) (Van der Hulst & Channon, 2010, p. 153). Bébian came up with a list of symbols/glyphs to represent handshapes and movements as can be seen in Figures 3.1 and Figure 3.2.

Bébian's work was very avant-guard and it has been suggested that Stokoe (Section 3.8.2) who is considered the pioneer of sign linguistics, may have derived some insights from Bébian's monograph.

Figure 3. 1: Some handshape glyphs of Bébian (1825) Image taken from Renard (2004) with permission from Marc Renard.

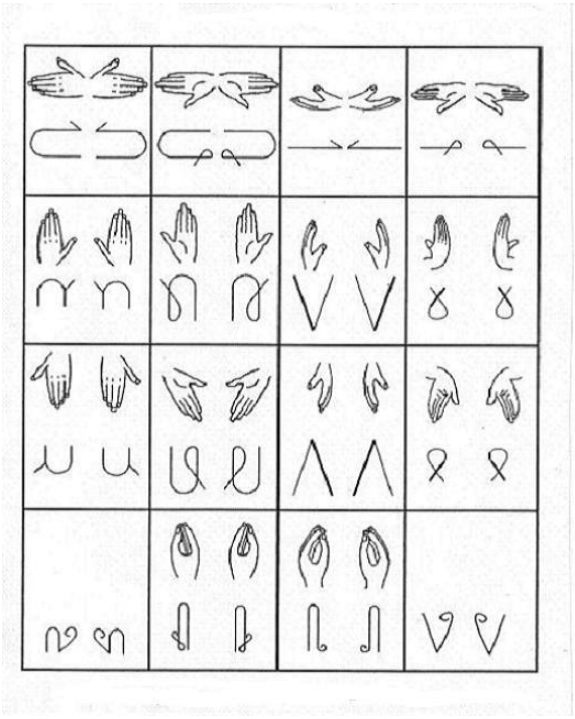


Figure 3. 2: Some Movement Glyphs of Bébian's system (1825). Image taken from Renard (2004) with full permission.

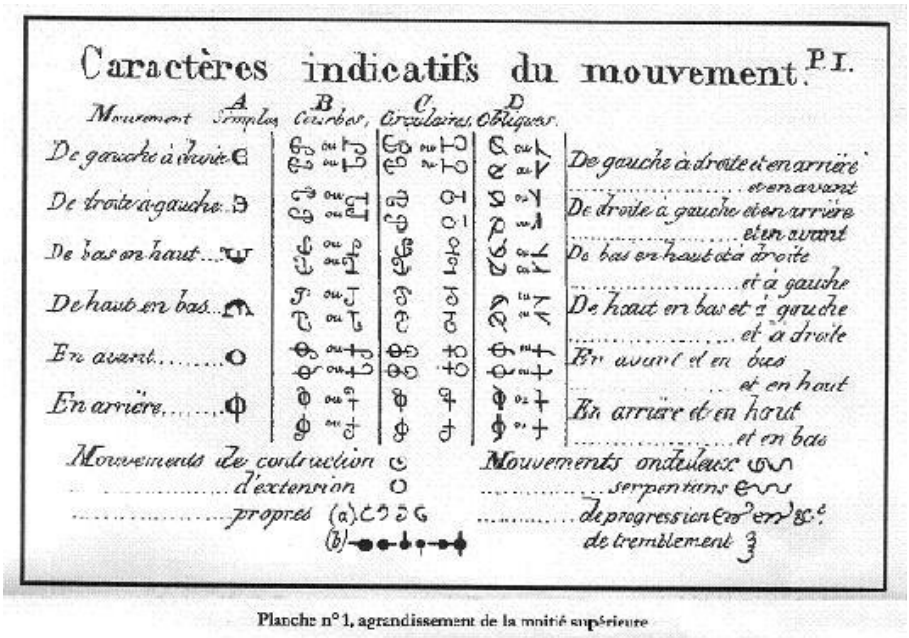


Planche n° 1, agrandissement de la moitié supérieure

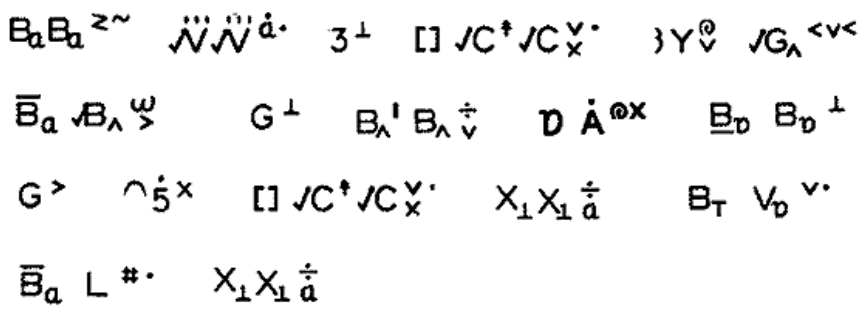
3.7.2 Stokoe's System

William Stokoe (1960) managed to find a way to analyse ASL's simultaneous articulation. He did so with the aid of a system that he created to represent ASL, a system known as the Stokoe system. This system was presented for the first time in his 1960 work and later used for the transcriptions of ASL signs (Stokoe, Casterline & Croneberg, 1976).

The Stokoe system (Figure 3.3) has a finite set of symbols that represents handshapes, locations and movements. As Martin (2000, p. 7) notes, Stokoe et al. (1976) did not devise this system for writing, but rather his aim was to prove that ASL signs have internal structure. Symbols were created to represent handshapes, locations and movements purely for linguistic analysis in a similar way that the symbols of the IPA were created to represent physical speech segments.

The original Stokoe notation consisted of three groups of symbols that amounted to 55 symbols. Each group represented one of the formational parameters of a sign recognized at the time - Location, Handshape, and Movement. These symbols were placed in a strict order. Symbols for location and movement were iconic and the handshapes was represented by units taken from the number system and manual alphabet of ASL. The system also consisted of subscripts that showed palm orientation, later to be identified as a separate parameter.

Figure 3. 3: Sample of Stokoe notations



Hoffmann-Dilloway (2011) compares the emergence of the Stokoe system and that of SW. Following Martin (2000) she claims that Stokoe's (1960, p. 40) choice for the order of symbols was not arbitrary. Hoffmann-Dilloway suggests that Stokoe's choice for the linear ordering of symbols was intentional since this would facilitate the printing of his notation since printing was dominated by typewriters in the 1960s. Additionally, Hoffmann-Dilloway adds that since Stokoe was creating a dictionary of ASL, having a linear sequence of symbols made it possible for him to sort the symbols in order according to the first symbol found in the linear sequence in the same way dictionaries for spoken languages are ordered alphabetically. The point that Hoffmann-Dilloway (2011) makes is as follows:

> (...) (T)his choice nevertheless reinforces the common notion that writing systems should be arbitrary and linear and has consequences for the utility of SN (Stokoe Notation); reading in linear sequence linguistic elements that appear simultaneously in actual signing practice is highly challenging. As a result, SN has remained primarily a tool for expert research and has not been used as a daily writing system by d/Deaf signers. (p. 349)

3.7.3 SignFont: An attempt to create a writing system

> The creation of SignFont was a serious attempt to create a written form of Sign Language that is easy to learn, easy to read and easy to write by hand or by computer. Other people have tried to do this before, and we are building on their experience (Newkirk, 1986, Preface).

In 1978 Newkirk reated a system of symbols that represents handshapes, locations, contact and movements. Newkirk revised his system in 1986 in a paper called *Outline of a proposed orthography for American Sign Language.* He preferred to call his system a 'writing system' as his hope was that it would become an orthography for ASL:

> This writing system has been designed to be powerful enough to record the fine details of ASL performance which are of great interest to linguists and, it is to be hoped straightforward enough to be used as an everyday written medium for the language, whether for personal correspondence or literature (Newkirk, 1986, p. 1).

Newkirk's effort and invention shows his awareness of the need and use of a writing system for the Deaf. However although Newkirk used the words 'orthography' and 'writing system', what he had created was another notation system for sign language including more symbols for additional parameters not marked in Stokoe's system.

The use of the word 'orthography' in his title does not correspond to the definition of 'orthography' as used in this work (see Section 3.2.2). It is not possible to talk of

an orthography prior to the creation and use of a writing system. It was Newkirk's ultimate hope to create an orthography for ASL, but in doing so he was actually attempting to create a writing system for sign language. The creation of an orthography would have been a later step had his system been gradually accepted and used by the ASL language community as a writing system (see Section 3.2.5).

SW is naturally developing in this manner. It has been established with ISWA 2010 and is now being used by language communities across the globe (Appendix A, Section A9). Sign languages that use SW can be said to have an orthography that is being developed, due to the writing choices being made when writing using SW.

Newkirk's (1986) attempt to create a writing system seems to have failed. The last update to the system was recorded in 1999, and there seems to have been no new developments to the system since then. The limitations of SignFont are the same as the Stokoe System and the HamNoSys (see Section 2.8). Newkirk (1986) had hoped to surpass the Stokoe System: "yet it (SignFont) strives to represent a wealth of detail missing from Stokoe's perhaps more graphic 55-plus symbols." (p. 2). Despite the attempt, SignFont is not a writing system and is not widely used as a notation for sign language transcriptions either.

3.7.4 HamNoSys System

> The Hamburg Notation System for Sign Languages (HamNoSys) is an alphabetic system describing signs on a mostly phonetic level. As many sign notation systems developed in the last 30 years, it has its roots in the Stokoe notation system (...). (Hanke, 2004, p. 1)

HamNoSys (see sample in Figure 3.4) developed from Stokoe's system into a more complex one that could account for the gaps mentioned in Stokoe's system (Hanke, 2004, p.1). This system started to be used around 1986. It is widely used by Australian sign linguists such as Trevor Johnston and Adam Schembri amongst others. For more information on HamNoSys visit http://www.sign-lang.uni-hamburg.de/Projects/HamNoSys.html and http://www.sign-lang.uni-hamburg.de/dgs-korpus/index.php/hamnosys-97.html (University of Hamburg, Retrieved July17, 2013).

The HamNoSys system was not created for the purposes of writing a language but for linguistic investigation. In fact Hanke (2007, p. 58) states that HamNoSys primarily describes single signs and is not used for writing sentences. This indicates that HamNoSys is not a writing system but a transcription (see Section 3.7) written in a linear sequence.

Hanke (2004, p.1) gives a list of the goals the HamNoSys would like to achieve. These include its international use, economy, integration with standard computer tools, the creation of formal syntax, and that it might be extendable so that older versions of HamNoSys do not become invalid as newer versions become available.

There are several shortcomings in the use of HamNoSys for computer tagging of transcriptions of utterances since there is no working orthography at present:

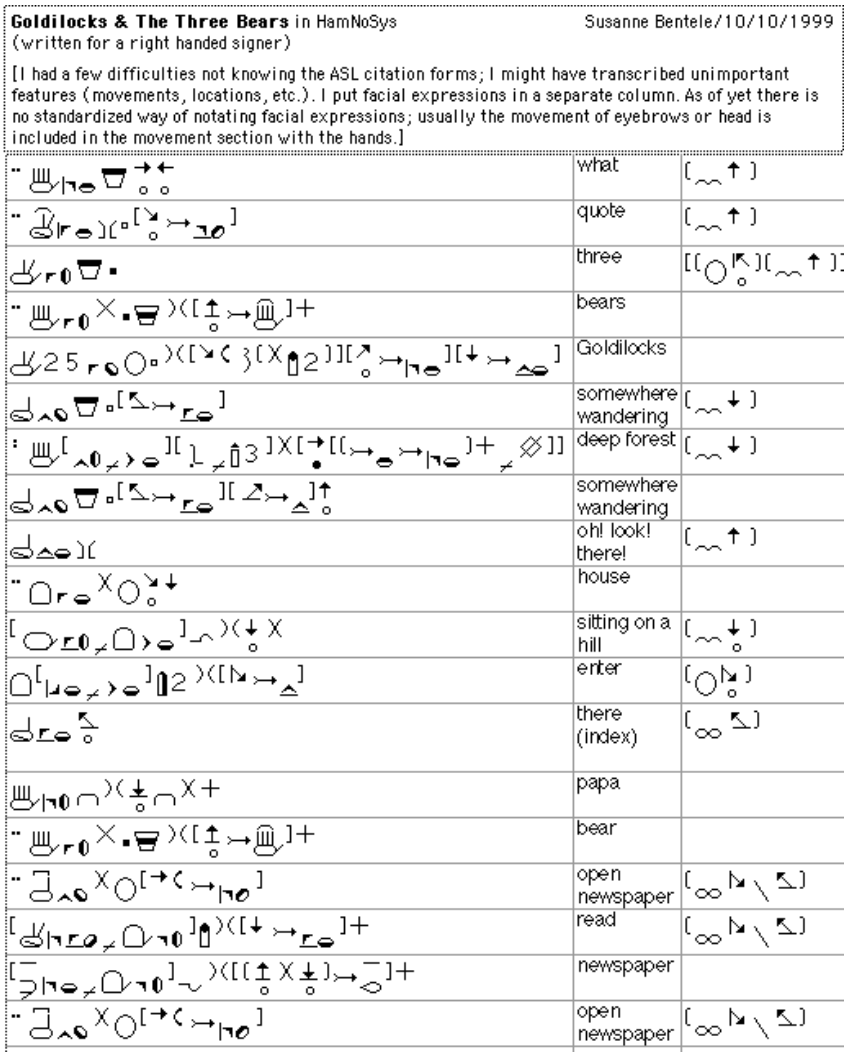
> What may be substituted in spoken language corpora by automatically searching the transcription data cannot be avoided for sign language

> corpora as long as HamNoSys or other notation systems do not establish a working orthography. (Hanke, 2004, p. 4)

However, Van der Hulst and Channon (2010, p. 168) claim that HamNoSys is primarily a transcriptional system, but the limitation of HamNoSys described by Hanke (2004) is due to the fact that this system should be used as a coding system:

> In comparing coding and transcription systems, we can note first that both must be bi-unique and complete. The crucial distinction is that a coding system must allow computerized sorting, counting and comparing of any significant characteristic, while a transcription system need not (it may not even be computerized). (Van der Hulst and Channon, 2010, p. 168)

Figure 3. 4: Sample of HamNoSys transcriptions by Susanne Bentele from www.signwriting.org with permission.



3.7.5 Si5s: A handwritten writing system for ASL

Arnold (2007) created a writing system specifically for ASL and called it 'si5s'. The work which is a Master's degree contains certain problems which are discussed here.

It includes general statements that are not grounded in scientific study. For instance there is a discussion on the number of strokes required to write si5s and SW. In his work it is claimed that si5s requires fewer strokes to write than SW: "The economy

of SignWriting requires greater effort to write a sign, three to five times more strokes, compared to the proposed ASL written system." (Arnold, 2007, p. 110). This claim is not based on the results of a comparative study of people writing si5s and SW, but is an assumption. It is not known whether SW requires fewer or more strokes than si5s and furthermore SW has short-hand form[22] (see Figure 3.5) involving fewer strokes.

Another argument in the work concerns the worth of SW on the basis of the claim that SW was created by computer rather than by hand: "It is not feasible to have a writing system created by the computer prior to creation by handwriting." (Arnold, 2007, p.110). There are two problems with this claim. First the claim that SW has been created by the computer is incorrect. Rather SW began as a handwritten system prior to the creation of software to edit it[23] (see Section 2.10 and Figure 3.5). Secondly, the author does not explain why such a hypothetical writing system would not be feasible and on what basis he is making such a claim.

[22]This short-hand form may not be highly used today due to the ease of the SignWriting computer programs (see more in Chapter 4, Section 4.10).

[23]Information obtained from http://www.signwriting.org/library/history/hist008.html

Figure 3. 5: Sample of a few shorthand handwritten sentences of Goldilocks. Image reproduced from http://www.signwriting.org/lessons/cursive/shorthand/ *with permission from Valerie Sutton.*

Another problem identified in Arnold's work is his classification of SW as a writing system, where SW is described as "an ideographic-based logographic and notational system" (Arnold, 2007, p. 100). Arnold claims that SW glyphs, such as arrows and facial expressions are ideographs: "SignWriting consists of ideographic-based symbols for world-wide interpretation, having converted such symbols to fit its purpose, and making the symbols logographic." (Arnold, 2007, p. 100).

An 'ideograph' is defined as "an outmoded term widely used to refer to non-alphabetic writing of various kinds. Its literal meaning suggests a mode of writing

consisting in symbolizing an idea directly, as distinguished from the linguistic form by which it is expressed." (Coulmas, 1999, p. 224).

The arrow glyphs in SW represent movement in sign language (see Section 2.5). Hand, finger, and body movements in sign languages are part of the phonological makeup of a sign. Even in the first linguistic analysis of ASL, Stokoe talked of three parameters tab (location), dez (handshape) and sig (movement) (see Section 4.2.1). SW arrow glyphs are not ideographic.

The smile is one of several facial expressions used in sign languages. Hoffmann (2011) notes that there is a Deaf preference for the writing of the smile with certain lexical signs. In this study 90% of the Deaf participants preferred the inclusion of the smile with certain lexical signs (see Section 8.82). Thus the smile is an integral part of the sign, it is not an ideogram and it needs to be represented in written form. In this work SW is defined as a featural system that has a semantic element due to the transparency of the glyphs of iconic phones (see Section 4.2.4).

Furthermore si5s still requires the representation of movement, since movement is a parameter of sign and thus uses a different glyph to represent movement (see Figure 3.6).

Figure 3. 6: An arrow showing movement to the right, and an 'arrow' of si5s showing the same movement to the right, with a dot rather than an arrow head.

The last point mentioned concerns Arnold's (2007, pp. 99-100) claim that SW is used to write sports, dance and other movements. This is incorrect. As described in Chapter 2, SW is distinct from MovementWriting. The glyphs of the ISWA 2010 include only the glyphs required to write sign languages. MovementWriting, SportWriting and DanceWriting contain glyphs that are not used in SW.

3.7.6 Limitations of Stokoe, HamNoSys and SignFont systems

Rosenberg (1999), Bergeron (2004), Martin (2007), Hoffmann (2008), Thiessen (2011) and Bianchini (2012) all note that unlike SW, the Stokoe system, HamNoSys and SignFont have limitations.

Bergeron (2004) notes that the main shortcoming of SignFont, Stokoe System and HamNoSys is that the symbols are written in a linear sequence and this does not reflect the nature of the language that is largely simultaneous. Bergeron (2004) follows Prélaz-Girod's (2004) analysis of different notation systems in comparison to SW:

> Après analyse des différents systèmes existants, SignWriting nous a paru être le système de notation le plus adapté aux caractéristiques visuelles et non linéaires de la LS et par conséquent le plus adapté à notre projet ainsi qu'aux besoins des enfants sourds. A contrario, les

> autres systèmes de notation de la LS restent pour la plupart dans une linéarité, certes proches de l'écrit traditionnel, mais fort éloignés de la langue des signes (dont les composantes se réalisent simultanément dans l'espace) et complexes dans leur utilisation[24]. (Prélaz-Girod, 2004, 5.Ecriture de la langue des signes[25].)

Stokoe system, SignFont and HamNoSys have never been used by a community for writing any literary work. They have proven to be useful for linguistic analysis but SW alone has been used for literary works. It is only SW that has been successfully used as a writing and reading system for sign language:

> We also found from the start that when texts produced by one of us were read by different signers (not just by their author), the readers were able to accurately "rebuild" (e.g.: to sign "aloud") the signs encoded in SW glyphs, and interpret the overall meaning of the texts, in a way that we have never experienced with any other notation for SL. (Di Renzo et al., 2006, - 3. Writing and transcribing LIS texts[12])

Thiessen (2011) also remarks on one of the weaknesses of HamNoSys, Stokoe and SignFont vis-a-vis SW. This weakness is that their inventory of head and facial parameters is limited or non-existent when compared to SW (Thiessen, 2011, p.

[24]Translation: "After analyzing the different existing systems, SignWriting seems to be the notation system most suited for the visual characteristics and nonlinearity of sign languages and therefore most suited for our project and the needs of deaf children. In contrast, other notation systems of sign language are mainly linear and complex notations to use, since they are closer to the traditional writing, but very far from sign language (whose components are realized simultaneously in space) and complex for use" (Prélaz-Girod, 2004, 5.Ecriture de la langue des signes)
[25]No page number available.

126). Thiessen adds that these three systems “imitate writing systems for spoken languages in that the symbols are written in linear streams of characters that must be mentally reassembled by the reader into the three-dimensional sign it represents.” (Thiessen, 2011, p. 2).

Hoffmann (2008, p. 46) makes an interesting observation while comparing Stokoe’s system to Sutton’s SW. She talks of these two very different types of notation systems for sign language. She claims that a writing system for sign languages as SW may never have been created had it not emerged from a completely different field, i.e. choreography and dance. She claims linguists are pre-conditioned about notions of writing and bring in linguistic theory in the creation of a writing system for sign language and this can be seen in the Stokoe and HamNoSys systems notably in their linear structure (Section 3.9.2 and 3.9.4).

Van der Hulst and Channon (2010) note that at times HamNoSys and SW seem to be in competition to one another and that this need not be the case as each system has a different function:

> Are SignWriting and HamNoSys in competition with each other? Which should be used as coding systems for the analytic study of signs? We argue here that that SignWriting is (primarily) a writing system and HamNoSys is a transcription system, and are not in competition, but that neither should be used for a coding system. (p. 3)

Despite the preference many seem to have for SW as a writing system rather than the other notational systems (Sections 3.8.1 to 3.8.5), van der Hulst and Channon (2010) argue that the other systems such as HamNoSys and Stokoe systems could all function as both a writing system and a transcriptional system:

> it seems that SignWriting, HamNoSys and the various Stokoe-based systems are actually all potentially both writing and transcriptions systems. This appears to be a joint result of their featural as opposed to alphabetic nature and their iconicity, which seems to lead naturally to rigid bi-uniqueness. (p. 168)

In addition to this Van der Hulst and Channon (2010, p. 168) claim that for computational purposes, HamNoSys is probably a better transcriptional system than SW. The linear structure of HamNosSys and the smaller number of glyphs than SW makes HamNoSys more easily computerized.

3.7.7 SW as a writing system and a transcription[26] system

SW is a writing system (see Chapter 2) and it is also used for transcriptions of sign language data. Hoffmann (2008) has used SW for transcriptions of Nepali Sign Language in her doctoral dissertation. SW has also been used as a notation system for LSM in Azzopardi-Alexander's (2003; 2004) LSM dictionary and Mifsud's (2010) study of LSM superordination. Galea (2006) transcribed data concerning LSM classifiers using SW. Azzopardi (2001) transcribed signed stories using SW. At the

[26] More information can be found here:http://www.signwriting.org/lessons/transcribe/

time of this work (Azzopardi, 2001), handwritten SW was used. SW has also been used for transcription in the LIBRAS dictionary (Capovilla, 2004).

Hanke (2004, p.1) claims that most notation systems for sign language have their roots in the Stokoe system. This is not the case for Sutton SW (see Chapter 2). It is the only system from the ones presented here that has developed out of a completely different field, that of dance.

SW proved to be an extremely useful tool for phonetic transcriptions of LSM, which aided linguistic analysis. The only problem with the use of this system is, as has been noted by Johnston and Crasborn (2006), that not all researchers use the same transcription notation in the same way that researchers use the IPA for spoken languages. This may make SW a little difficult to access by others unfamiliar with the system and who would like to use the work.

Another example where SW has been used for linguistic analysis is Butler and Channon's (2010) work where they used SignPuddle 2.0 to check for the frequency of handshapes used across signed languages. They used inputted sign language data from several countries and from this inputted data they checked for frequency of handshapes.

3.7.8 SW and emerging orthographies

Despite Van der Hulst and Channon's (2010) claim that every notation system that has been derived from the Stokoe system, as well as SW, could potentially be transcription systems and writing systems (Van der Hulst, & Channon, 2010, p. 166), it is argued here that only SW is being used by different SL users to the extent that

orthographies for different sign languages are beginning to develop on the basis of the language-specific writing choices that are made. Only SW can be called a writing system that is spreading and developing into different orthographies (see Appendix A).

3.8 SW ORTHOGRAPHIES

In Section 3.7.3 Newkirk's (1986) attempt to create an orthography for ASL was reviewed and it is seen how this attempt failed. Only when a writing system starts to be used for the writing of a language does an orthography for that language begin to develop. SW is becoming a highly used writing system (see Appendix A).

Martin's (2005) unpublished paper is significant in his observation of different orthographies that use SW:

> Different languages written with SignWriting also have different orthographies. Spanish Sign Language uses SignWriting's contact symbol. Danish Sign Language doesn't. Nicaraguan Sign Language underlines proper names. American Sign Language does not. These languages are written in SignWriting script, but with different orthographies. (p. 3).

What Martin doesn't acknowledge in this paper is that although sign languages are using SW, serious academic study concerning this has not yet been carried out. The first known work is that of Bianchini (2012). There are several manuals that describe the use of SW for different sign languages (see Appendix A, Section A3), and

examples of SW are given using the signs of the specific languages. Despite these works, a study into the orthography of a sign language has only just started with the work of Bianchini (2012).

In the creation of SW manuals and during the process of writing longer texts for specific sign languages, it is natural that certain patterns of writing start to emerge. However, to what extent these patterns are regular or haphazard has not yet been investigated.

Arriving at a point where we are discussing orthographies rather than writing system means that the system has been used substantially. It means that the issue of *which* writing system best meets the needs of sign language has been well established and that writing systems can confidently be analysed and applied to the writing of specific languages.

3.8.1 Adapting SW

3.8.1.1 Bergeron (2004) 'Improvements' for SW

Although Bergeron (2004) does not investigate the orthography for writing the Sign Language of Quebec (henceforth LSQ), she paves the way for this work to begin and is aware that this is the next necessary step in the evolution of a writing system for LSQ. Bergeron discusses the need for SW to be simplified (Bergeron, 2004, p. 132), a need that is also recognised by Thiessen (2011).

Bergeron (2004) carried out work that investigated the use of SW for LSQ. Her work did not involve the analysis of SW data of LSQ, however it looked into the different notation systems for sign language and argued in favour of SW.

Furthermore Bergeron's (2004) work included a proposal for the 'improvement' of SW. What Bergeron (2004) was actually pointing at was the adaptation of SW for the writing of a specific language, in her case LSQ. The word 'improvement' means that the SW is not good enough, however evidence points to SW being good enough to write any language. The natural evolution of SW is to be adapted and modified for the writing of specific sign languages.

Bergeron (2004) proposes that SW should become more economical. She further adds that this can be done in two ways. The first proposal is to create a bi-unique system where one grapheme[27] represents one phoneme in the language and thus avoid redundancy (Bergeron, 2004, p. 132). In this work the question whether this can be accomplished for LSM from analysis of the LSM texts is investigated. The second way to create more economical SW is by using the shorthand system of SW (see Section 2.10 for more). This is not investigated further here, since it is not within the scope of the work.

Bergeron's (2004, pp. 134-136) second proposal for 'improving' SW is to add the spoken component to SW signs where the need arises for disambiguation between highly similar and ambiguous SW signs. In one instance of the use of a SW spoken mouth pattern-glyphs for the disambiguation of a pointing sign HEMM (THERE) (see Section 6.5.1, no. 49) was found, however the question of the use of spoken mouth

[27] In this work 'glyph' is used (see discussion in Section 2.3.2), Bergeron (2004) uses the term grapheme.

pattern glyphs goes beyond the scope of this work, and is not investigated further here.

The third proposal put forward by Bergeron (2004) is to improve the representation of space using SW. Bergeron (2004, p. 137) is aware that the use of space in 2d SW could be improved upon: "Une autre amélioration possible pour le SignWriting concerne la difficulté de représenter les trois dimensions spatiales sur une surface à deux dimensions." (Bergeron, 2004, p. 137)[28].

The reason for improving the written representation is to disambiguage between the use of spatial loci and referential points that need to be clear in LSQ: "C'est pourquoi nous proposons de recourir au besoin à des indices graphiques afin de pouvoir désambiguïser à l'écrit l'attribution et l'utilisation de loci spatiaux dans le discours signé.[29]" (Bergeron, 2004, p. 138).

Bergeron (2004) did not continue to propose a specific way of disambiguating spatial loci using SW, and claimed that any marker would do: "Ces indices pourraient aussi être utilisés dans la référence et dans l'accord verbal.[30]" (Bergeron, 2004, p. 138).

In this work an attempt is made to answer the question of how to disambiguate between the different referential loci used in LSM agreement verbs and pointing

[28] Translation: "Another possible improvement concerns the difficulty SignWriting has of representing the three spatial dimensions on a two dimensional surface."(Bergeron, 2004, p. 137)

[29] Translation: "That is why we propose the need to use graphic clues in order to disambiguate written allocation and use of space in the discourse signed loci ." (Bergeron, 2004, p. 138)

[30] Translation: "These [glyph] markers could also be used in reference and verbal agreement." (Bergeron, 2004, p. 138)

signs. Finally the fourth suggestion put forward by Bergeron (2004, p. 139) to 'improve' SW is to add a visible line between columns to make reading easier.

3.8.1.2 McCarty on simplifying a notation system

McCarty's (2004) also mentions simplifying a system in an article on notation systems for sign language, with focus on the Stokoe and Sutton system. Even though there is no mention of orthography, her final question points to the need for orthography rules as she states:

> Considering the major dimensions of ASL, what degree of precision is necessary for functional literacy? Although speed, volume, intonation, facial expressions, gestures, and other features of spoken languages add meaning to our utterances, they are not represented in our written forms. Stokoe's system represents only 3 major dimensions of ASL, whereas Sutton's represents 10 or more. A balance will have to be achieved between the accuracy of the system's representation of the signs, and the difficulty of learning and producing the written stimuli. (McCarty, 2004, p. 133).

3.8.1.3 Van der Hulst & Channonn (2010)

Van der Hulst and Channon (2010) also recognise that the written forms of signs need not be phonetic, but rather contain enough glyphs or combinations of glyphs to read the intended sign represented in written form. They claim that "a written representation of a word does not need to be a recipe to produce it, but only to be

sufficiently unique to act as a trigger to activate the relevant words in the reader's mind." (Van der Hulst & Channon, 2010, p. 154)

Van der Hulst and Channon (2010) describe redundancy of an emerging orthography. Reasons for redundancy have been explained as follows.

> Sign systems typically do not go for minimal differences and the reason is that minimal differences can easily be missed, i.e. overwritten by 'noise' or by the detrimental effect of overzealous production efficiency or 'laziness'. To counterbalance noise and signal deterioration, signifiers tend to display redundancy in their form. It has long been understood (cf. Shannon and Weaver 1949) that if differences are minimal the slightest 'noise' may cause confusion, wiping out the crucial difference between two forms. (Van der Hulst and Channon, 2010, p. 163)

Van der Hulst and Channon (2010) describe redundancy that occurs when writing a language. This leads to the question about the LSM texts. The LSM pointing signs are minimally different and ambiguous in written form (see Sections 6.5 and 6.6) and this reflects the fact that the salient differences between them have not yet been identified.

3.8.3 Dilemmas and genre of text

Although Hoffmann-Dilloway's (2011) study does not investigate the orthography of any given sign language, she is aware from the discussions in the SW list that people are having dilemmas when it comes to the choice of how to write something using

SW. For instance in the 'Cat in the Hat' translated by Cherie Wren this author had a dilemma when it came it the writing of eye-gaze:

> Regarding the shifts in eyegaze, Wren wrote to the list: ''How much of it needs to be written?. . . I am looking at the door, and the cat coming in, and back to the audience several times in that very short sequence. This is something I struggle with on a regular basis. How much detail is too much, how much is necessary? I am trying to tease out the required grammatical bits. . .'' ...Wren's question poses, can the eyegaze toward the story's audience also be treated as ''required'' and ''grammatical'' and therefore written? Ultimately, as seen below, she decided to include in the written text the eyegaze toward those viewing the story (…). What informed that choice? This decision was likely influenced by the genre of the text: ASL story telling. (Hoffmann, 2011, p. 353)

3.8.4 Attitudes towards SW orthography

The acceptance or rejection of a writing system or orthography is not entirely dependent on the linguistic structure of the writing system (Coulmas, 2009; Hoffmann-Dilloway, 2011). One fundamental factor is the native speakers' perspective of the writing system/orthography. In the case of the emergence of an orthography for a specific language, the language attitudes and perception of Deaf people are crucial in the planning stages of an orthographic system. For as Coulmas rhetorically questions, what is the use of a linguistically "perfect" writing system if

that writing system is rejected by the language community and not put to use? In this study Deaf participation is elicited by means of a reading-questionnaire (Section 5.5) and their feedback is incorporated into the work.

Hoffmann-Dilloway (2011) notes that there is disagreement on the subject of how much detail needs to be included in SW text. She notes that people trained in the linguistic field tend to prefer written structures that are simpler and would not add extra paralinguistic information to the symbols, keeping in line with linguistic theory and traditional writing systems. Deaf people who use SW are not all linguists and seem to prefer the inclusion of the nuances of their language can be captured and therefore see paralinguistic information as crucial when writing their language.

Hoffmann-Dilloway's (2011) analysis of paralinguistic representations is based on the eye-gaze dilemma in Cherie Wren's translations of 'The Cat in the Hat'. Two options have been presented: to include the eye-gaze looking at the audience or to leave it empty. There may be another option: a default eye-gaze setting. Here a rule may be established for a language community where the absence of eye-gaze represents eye-gaze towards the addressee.

Hoffmann-Dilloway (2011) notes that a SW ListServe (email network) participant's attitude to paralinguistic information of a smile being represented in graphical form expressed as follows: ''If it is part of the nuance of the sign, yes...one of the very valuable things (about) SignWriting (is that) it captures our language the way we use it'' (Hoffmann-Dilloway, 2011, p. 354)

Another key Deaf person using SW, Adam Frost, wrote this in his introduction to a paper presented in Lisbon:

> I was born Deaf, and I am native to American Sign Language. I personally use SignWriting to express my innermost thoughts and feelings. I don't have to take the focus of trying to express them into English to write them. Writing in SignWriting also gives me the ability to place ASL and English side by side and learn both languages better than without SignWriting. I strongly believe that all Sign Languages can and should be written. Many Deaf people throughout the world agree with me. (Frost & Sutton, 2009, p. 109)

3.8.5 Adaptation of SW for LIS

Di Renzo, Lamano, Lucioli, Pennacchi and Ponzo (2006) described the process of adapting SW for the needs of writing LIS. They discovered that phonetic writing resulted in ambiguities and that when LIS was written with such detail it often made the reading of the texts unclear. They specifically noted that "the written text did not provide sufficient information to identify which of two characters of a narrative performed a given action" (Di Renzo et al., 2006, p. 3). They do not go on beyond to describe how they solved this problem. In this work the same observation was made for the LSM texts (see Section 6.6), however, the work goes beyond the observation and attempts to solve the problem of ambiguity using SW.

Di Renzo et al. (2006) claim that the ambiguity that arose with reading the LIS texts was comparable to:

> (…) those that may be found in texts written by vocal language speakers who are not very familiar with the written modality of language expression, hence produce texts that are closer to an "oral" form of language, where information that is necessary in writing can often be omitted without compromising speakers' comprehension. (p. 6).

Di Renzo et al. (2006) were aware of the development of SW as a writing system from that of a notation system as they explain here:

> When comparing transcriptions with written texts, the SW transcripts tend to contain more facial glyphs that aren't strictly related to the content of the narrative, such as prosodic expressions, like hesitations or "pauses of reflection", while in the written texts we produced this kind of prosodic glyphs are absent. This detail made us even more aware of the conceptual and empirical differences between transcribing and writing. (Di Renzo et al, 2006, p. 4)

They also felt the need to adapt the SW manual (Sutton, 1999) to the writing of LIS: "As we proceeded in our work with LIS texts, we realized that we needed to do a complete adaptation of Sutton's (1999) SW manual for use within the Italian Deaf community." (Di Renzo et al, 2006, p. 4). In this work, it is recognized that a manual for the writing of LSM is required. Final recommendations for writing LSM are found in Chapter 11. A manual for the writing of LSM can be found in Appendix G, that can be used by those learning SW for LSM.

Another benefit of using SW for LIS is reasoned to be the cognitive process that is involved in the metalinguistic awareness of writing rather than transcribing phonetically:

> The issue of representing signed languages requires a profound metalinguistic awareness of "writing" as distinguished from "transcribing". This distinction is often taken for granted in spoken language research, but is rarely made clear in research on signed languages. We strongly believe that a thorough awareness of this distinction is quite crucial when dealing with four dimensional languages that have not spontaneously evolved a written form, such as our language, LIS. (Di Renzo et al., 2006, p. 5)

The merit of the nature of the work carried out in this dissertation is expressed by Di Renzo et al. (2006):

> It would be very useful to create and analyze not only transcriptions of signed data (which reflect the equivalent of the "oral" modality of spoken language use), but also corpora of texts *conceived and expressed directly in a written form*. (Di Renzo et al., 2006, p. 5).

They are aware of the merits of studying the written form of a sign language, from their experience of writing LIS using SW:

> We have found that many insights on the structure of LIS lexicon and grammar can be gained by reflecting on the structure of texts, on how

> the individual components of a text need to be segmented and are at the same time interrelated to express meanings. (Di Renzo et al., 2006, p. 5).

3.8.6 Bianchini (2012) and writing LIS

Bianchini's (2012) work examined the SW skills of six Deaf participants in view of the issue of metalinguistic awareness. Although six participants may appear to be a small number, the number is large as a proportion of the Deaf community (Section 1.4) and even more so in view of those competent in SW (Bianchini, February 2014, personal communication).

Bianchini (2012) found that SW is useful for the development of metalinguistic awareness in Deaf people. LIS users provided her with feedback regarding the glyphs of SW, where they expressed preference for additional SW glyphs for the writing of their language, LIS. SW has a limitation of inconsistent sizes for arrow-enlargement and incomplete rotations for some ISWA glyphs. Bianchini (2012) recognised that adapting the ISWA glyphs to have a more regular system for writing LIS is an important step in the development of the orthography of LIS.

Bianchini's (2012) work however does not address the issues of what is truly required from the ISWA 2010 to represent LIS phonologically and morphologically, as this is not one of her research questions.

No known study has yet discussed the development of SW from a phonetic system to a phonological one. In a SW ListServe email received January 2014 it was suggested by linguist James Shepard-Kegl that a general SW grammar book is

created to show the ways that SW can embody the grammar of a visual-gestural language, due to the lack of work in the area. The work in this dissertation intends to fill this gap as far as LSM is concerned and may serve as a base for future work regarding the use of SW for the grammatical representation of different sign languages.

3.9 OVERVIEW OF SW IN FIELDS OTHER THAN LINGUISTICS

In the field of computer science and software engineering there are works carried out that examine how entries in SW dictionaries can be ordered by machines (Aerts et al., 2004; Butler, 2001). Other works concern the development of SW editing programmes and other software applications such as the creation of avatars that read SW (cf. Bouzid & Jemni, 2013a; 2013b) and SW Unicode support (cf. Aznar & Dalle, 2004).

In the field of education Flood (2002) carried out community based research where she studied the learning of SW by four Deaf elementary school children. She carried out detailed and qualitative reports about these children's progress in SW as well as interviewing forty other stake-holders. Her work shows that there are benefits in including SW in bi-cultural and bi-lingual programmes at the elementary level of education. One of these benefits is that students using SW feel they can acquire skills in literacy just like their hearing peers, and this psychologically enables them to be more open to learning in general.

Abushaira (2007) developed and applied a training program using SW to teach SW to Deaf students at the fifth grade at Al Amal school for deaf in Amman city. He used SW to teach a selected part of a science book from the second semester. His study involved 32 students who were divided into two groups, an experimental group of 15 students and a control group of 17 students. Although Abushaira (2007, p. 9) marks the numbers of students in his groups as a limitation, it is argued here that this is not a small number, in view of the small percentage of Deaf people in society (Section 1.4). His main finding was that the group who used SW as a tool for learning science, had a higher level of achievement in the subject, particularly where they learnt more vocabulary of the subject than the group that did not use SW.

In Brazil work that shows that SW helps with bilingual education has also been carried out. Campos and Silva (2013) argue that SW helps consolidate bilingualism since it gives access to two forms of expression of sign language – the signing itself and the graphical representation. They also stress the importance of academic research in the area of SW to contribute to and consolidate the written form of Brazilian sign language.

> Apesar de o sistema signwriting significar a conquista de uma forma própria de registro para a Libras, ainda há poucos conhecedores e usuários dessa ferramenta. É urgente a necessidade de estudiosos e pesquisadores de diversas áreas compreenderem o funcionamento desse sistema e acompanharem sua utilização pelos sujeitos surdos, a fim de contribuírem para a consolidação da escrita de sinais no Brasil,

que pode marcar definitivamente a história da comunidade surda. (p. 60)[31]

3.10 READING AND WRITING: COGNITIVE PROCESSES

Reading and writing are different to speaking and listening and different cognitive processes are involved. Evidence for this comes from people who have difficulty to write and not to read and vice-versa (Coulmas, 2003, p. 211). Writing is usually acquired after speech (Coulmas, 2003), however Deaf children may acquire the written language as a first language and naturally prior to speech, although not with the equivalent competence of their hearing peers (Steinberg, 1984).

3.10.1 Alphabets and Reading

The bulk of research about reading concerns the alphabetic writing systems (Section 3.5.3). Coulmas (2003, p. 210) comments that this is not surprising since the alphabetic writing system is the major writing system in the Western world, theefore leader in psychological research. A major breakthrough in reading theory was the discovery that in reading (even alphabetic writing systems) the primary processing unit of recognition is the word (Henderson, 1982). Coulmas (2003, p. 212) underlines that this is important as writing systems may now be categorized according to the processes involved for reading and writing. Rather than categorizing writing systems

[31] Translation: "Although SW means achievement of a particular representation for LIBRAS, there are few knowledgeable users of this tool. There is an urgent need for scholars and researchers from various fields to understand the functioning of this system and monitor their use by deaf people in order to contribute to the consolidation of written signs in Brazil, which can definitely mark the history of the deaf community."

according to the minimal units of the languages they represent (Section 3.3), writing systems may be classified on the basis of the cognitive processes involved in their use.

It has been recognised that for successful reading of languages written by alphabetic systems, the relationship between the graphemes and phonemes (Section 3.6.5) needs to be established by the reader:

> One of the components of reading activity in normal hearing children consists of decoding words. To decode a word, the child must establish the correspondence between the written string and the oral string, that is, the phonological form of the item. More precisely, this cognitive activity has been described as a grapho-phonemic assembling process: graphemes (e.g., b, d, th, oo) are associated with the corresponding phonemes (phonemes are the smallest units that can differentiate two spoken words; e.g., /b/, /d/, /θ/. /u/). This assembling process is important because it is a necessary step in reading development in language communities with alphabetic writing systems. (Transler, Leybaert and Gombert, 1999, p. 124)

The same relationship between grapheme and phoneme needs to be made when reading LSM, since SW is also an alphabet (see Section 3.6).

3.10.2 Writing

While substantial knowledge is available about reading, much less is known about the cognitive processes involved during writing. Writing involves a wider range of

psychological factors that need to work simultaneously in order to produce a piece of written text. Writing requires goal-setting, attention, planning, long-term and short-term memory, the translation of ideas into writing, and metalinguistic awareness that enables reviewing (Flower and Hayes, 1981, p.370). For this work, no further details on the cognitive processes of writing will be presented[32].

3.11 WORD/SIGN BOUNDARIES

3.11.1 The 'Word': Problems with its Definition

The definition of the 'word' is difficult to establish. This is due to the variant types of languages and thus variant types of definitions of words that are language-dependant. In this chapter the terms 'word' and 'sign' are used to refer to the same psychological reality of a linguistic unit that is independent and is recognisable, by native signers, from the stream of signing (Zeshan, 2002).

A morpheme is the smallest meaningful unit of a language. The term 'morpheme' is more appropriate for linguistic analysis since the term can be applied to the description of all languages. Despite the validity and usefulness of the term 'morpheme' for descriptive linguistics, speakers of a language have a better shared and common intuitive knowledge of what constitutes a word. Linguists would break up the following sequence /dogz/ into two morphemes /dog/ + /z/. Despite linguists' analysis of language reality, native speakers of English would naturally identify the

[32]For further information the reader is referred MacArthur, C. A., Graham, S., & Fitzgerald, J. (Eds.). (2008). *Handbook of writing research*. Guilford Press.

sequence /dogz/ as a word of the English language. Despite linguists' avoidance of the term 'word' due to its lack of universal applicability, the term 'word' remains a psychological reality for native speakers and signers and this reality is dealt with in the following sections.

3.11.2 Word Segmentation and Word Recognition: What comes first?

Unlike the written medium, where very often words are separated by spaces, in fluent speech words are not separated by clearly defined cues such as pauses. Psycholinguists have thus investigated whether there are physical cues in connected speech that mark word boundaries. Since children are able to dismantle connected speech, and acquire single words at a very young age (Clark & Clark, 1978), then this presumes that there must be physical cues that enable them to identify words during connected speech:

> A crucial step in mastering any language is to learn its words. However, because language learners most often hear words not individually, but in the context of other words in a sentence (van de Weijer, 1998; Woodward & Aslin, 1990), acquiring a vocabulary in the native language depends on some ability to segment words from fluent speech. (Jusczyk, Houston, & Newsome, 1999, p. 160)

Although there is as yet no clear definition of a 'word', there is substantial research in linguistics/applied linguistics that has investigated 'word boundaries' and 'word segmentation' in infants and adults. Paradoxically, the very nature of the search for

boundaries on words, presumes the existence of words in languages. Results from these works also suggest definitions of the physical word in spoken language.

Psycholinguists have been interested in word-boundary cues in order to come close to understanding how a child acquires language from connected speech. More recently research in speech-segmentation is being undertaken in the field of information technology (IT), where the segmentation of speech is required for its recognition by machines and computers (cf. Brent, 1999).

Segmentation of words is intimately tied to the recognition of words. As noticed by Cairns, Shillcock, Chater and Levy (1997) this aspect of human language acquisition is a chicken-egg question: what comes first, segmentation or recognition? They claim that the reality is most probably a cycle where one process affects the other. Which process begins this cycle may never be resolved:

> Segmentation is the process by which the listener divides up the continuous speech stream into linguistically and psychologically significant units that can be used to access meaning. (...) The identification of a particular stretch of speech as a meaningful unit presupposes recognizing what that unit is, but recognition seems to be possible only once segmentation has been carried out. (Cairns et al., 1997, p. 111)

These same researchers (ibid.) point to the possibility of there being some degree of segmentation prior to recognition. Their claim is grounded in psycholinguistic theory:

> in development it seems that purely bottom-up cues[33] must be used, at least initially, since the child has not yet learned the linguistic units upon which interactive models rely (...). These units may differ among languages such as English, French, and Japanese. (Cairns et al., 1997, p. 113).

Whether speech segmentation occurs prior to recognition (bottom-up) or whether recognition occurs prior to segmentation (top-down), the fact remains that at a certain point 'words' are segmented from the stream of speech by native speakers. In the next sections I present a few theories on how this segmentation of words occurs.

3.11.3 The word as the minimal processing unit

Written words of an alphabet are sequences of letters. The question here is how we read these meaningless symbols/letters that combine into written words. Coulmas (2003, p. 212) claims that the whole point of reading is to elicit meaning not to intone. Many discussions held on the SW List are concerned with "intoning" sign language rather than representing meaning. Since SW is a highly phonetic system and has a huge glyph-set representing the phonetic level of sign languages (Section 2.6) a phonetic transcription can be carried out with relative ease.

In research concerning the cognition of reading, there are two main lines of thought. There are cognitive scientists who claim that the individual letters are paramount in

[33] "Bottom-up" means that the stream of speech is segmented prior to its recognition. "Bottom-down" is the opposite, where the speech is first recognised then segmented.

the reading of alphabets and others who claim that the letters are not as significant as the whole word when reading. The two lines of thought recognize that to a certain extent both the letters and the whole word are required for reading. What they disagree about is the extent to which one is more significant for the cognitive process involved in reading (Coulmas, 2003). As Coulmas states phonological decoding is *somehow* necessary. Different languages have different relationships between the letters of their alphabets and the phonological correspondence, as can be seen in the difference between shallow and deep orthographies (Section 3.3.4.3). Thus phonological decoding is always necessary to different extents but easier for shallow orthographies.

The study of Deaf children who learn how to read and write languages that use the alphabetic script prior to their acquisition of speech indicates that the written language can be acquired as a first language and independent of speech (Steinberg, 1984). This pushes forward the idea that the written word can be encoded as a lexical unit, bypassing speech.

Additionally research on the reading of Chinese supports this finding in Deaf children. Chinese characters do not encode speech sounds. Readers use the graphemic form to read, and when necessary they obtain the phonological codes through memory retrieval. Lexical access of the word precedes its phonological recoding. The reading of a deep orthography such as English has been compared to the reading of Chinese: “All fluent English readers eventually learn to identify whole words as if they were Chinese characters” (Steinberg, Nagata & Aline, 2001, p. 97).

It has also been suggested that the lexical access involved in reading is not bound to the level of the word only. In research on the reading of longer polymorphemic words it has been suggested that the readers also directly access the meaning of the morphemes (Taft, 2003, p. 24-25). The possibility of having a constant and uniform graphical pattern that encodes a morphological pattern of LSM will be considered in this study.

3.11.4 How Segmentation Occurs

Interactionalists (cf. Marslen-Wilson & Welsh, 1978; Cole & Jakimik, 1980) place a lot of weight on the communication and interaction between carer and child that assists in the lexeme-word identification of the child acquiring language. Theirs is a bottom-up theory[34], where it is thought that acquisition of the lexicon precedes segmentation:

> According to this account, it is the lexeme that licenses segmentation. As the speech input arrives over time, the words that become incompatible with the input are incrementally eliminated until one winning candidate emerges. The stored lexical phonology of the winner specifies the boundary at which the next word begins. (Cairns et al., 1997, p.114)

Researchers on the other side of the coin understand the process of speech segmentation as occurring through physical markers of natural speech. They exclude any influence from the lexicon in the process of speech segmentation.

[34]See footnote 1

Cairns et al. (1997, p. 115-116) identifies three different speech cues that enable segmentation of speech: 1) phonetic juncture marking, 2) prosodic marking, and 3) distributional information.

The first cue is a series of physical patterns that occur during the stream of speech, such as aspiration or alterations in voice onset time that act as markers of word boundaries (cf. Church, 1987). The second cue is a prosodic marking that specifies the onset of a word. Cutler and Butterfield (1992) for instance found that in the English stream of speech, a strong syllable is an indicator of the onset of new words. Iwano and Hirose (1999) also identified Japanese word-boundary through cues in specific prosody patterns of the language. The third cue at hand is distributional information, i.e. the use of phoneme sequence probabilities to predict likely junctures (cf. Saffran, Newport, & Aslin, 1996). As Cairns et al. (1997) note:

> Whereas many models use only one of these types of cue, there is no reason why various types of information should not be integrated; indeed, this is what we believe to be necessary for a complete account of segmentation. (p. 116)

3.11.5 Simultaneous Words

Zeshan (2002, p. 167) describes simultaneous words as actually "the simultaneous production of two words", meaning that two words are signed at the same time, an analogy which is impossible to find in spoken language due to the different physical medium of speech acoustics and the auditory sense.

> After a two-handed sign, one hand remains in place while the other hand articulates further signs (...). This intricate interplay of the two hands is a mechanism for which nothing comparable can be found in spoken languages. It is one of the fundamental yet important part of what constitutes the linguistic 'type' of sign languages. Therefore it should not be surprising that it may be difficult to talk about the relationship between grammatical and phonological words in these signed constructions. (Zeshan, 2002, p. 168-169)

Channon (2002, p. 4) notes that signs do have simple and limited sequences and that unlike the Stokoe system, SW provides for this:

> It is undeniable that Stokoe's notation system does not represent many signs correctly, because it doesn't distinguish between simultaneous and sequential elements. But in this dissertation, I assert that his original insight that signs do not have sequence is partially correct: signs do not have *structural* sequence, that is, signs do not have the sequential structure provided by multiple segments. Signs do however, have (simple and limited) sequences, which are handled by dynamic features (Channon, 2002, p. 4).

3.11.6 The Written Word

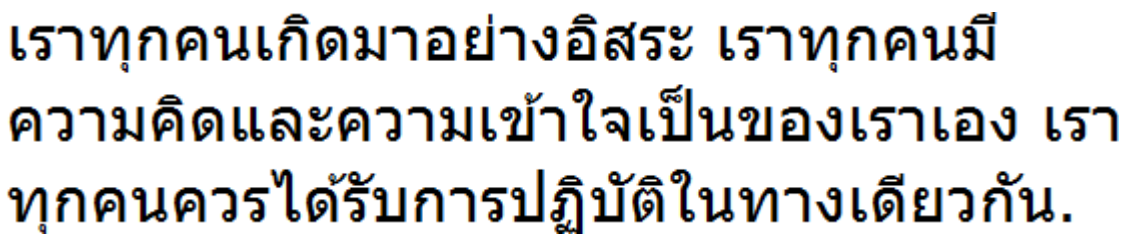
> In reading an alphabetic script such as this, this segmentation problem is easily solved: The reader can use the white spaces as markers to

word-boundary locations. (Orifanidou, Adam, Morgan & McQueen, 2010, p. 272)

As stated in the above quote perhaps the most straightforward definition of a 'word' can be made with reference to its representation in the written script. In the Roman Script each word is separated from another word by a space. Literate people using this script thus build their concept of a word from their knowledge of both the word in speech and in writing. In reading and writing, the word represents a lexical unit – meaningful and free-standing and is recognized by its graphical isolation from the following and previous word.

Thai languages are written as a continuous flow with no visible spaces or other word dividers (Morey, February 2013, personal communication) (see Figure 3.8).

Figure 3. 7: An example of sciptio continua: The Thai script. Image taken from www.omniglot.com with permission from Simon Ager.



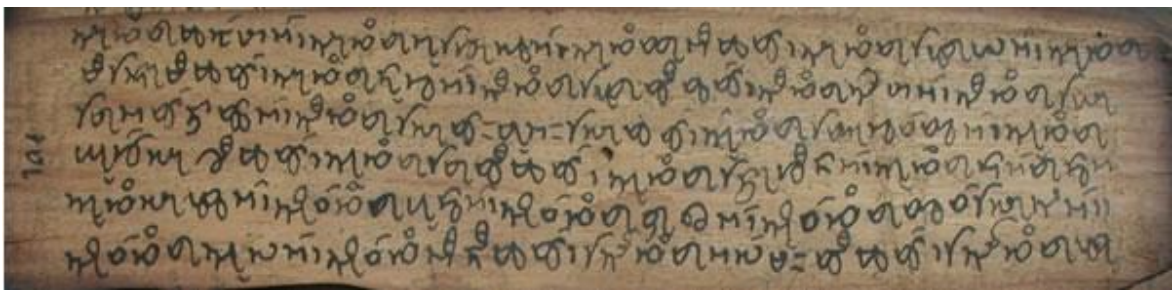
There are also scripts that do not have spaces between words but rather produce spaces between phrases, such as the Myanmar script (Burmese) (see Figure 3.8).

Figure 3. 8: The Myanmar script (Burmese) with spaces created between phrases. Taken from www.omniglot.com with permission from Simon Ager

လူတိုင်းသည် တူညီ လွတ်လပ်သော ဂုဏ်သိက္ခာဖြင့် လည်းကောင်း၊
တူညီလွတ်လပ်သော အခွင့်အရေးများဖြင့် လည်းကောင်း၊
မွေးဖွားလာသူများ ဖစ်သည်။ ထိုသူတို့၌ ပိုင်းခြား ဝေဖန်တတ်သော
ဥာဏ်နှင့် ကျင့်ဝတ် သိတတ်သော စိတ်တို့ရှိကြ၍ ထိုသူတို့သည်
အချင်းချင်း မတော်တာထား၍ ဆက်ဆံကျင့်သုံးသင့်၏။

On the website www.scriptsource.org the Ahom script is listed as scriptio continua, however in a recent conversation with Dr Stephen Morey it was clarified that in actual fact unlike other Thai languages, the Ahom script is sometimes written with spaces between words. A sample of the Ahom script can be seen in Figure 3.9 The Ahom script is still used by the Ahom priests who ue it to write their prayers, and by Ahom language revivalists who have printed many books in recent years (Morey, February, 2013, personal communication) Ahom is an abugida, i.e. a consonant-syllable alphabet.

Figure 3. 9: The Ahom script that does not always create spaces between words. Image taken from http://www.sealang.net/archives/ahom/ used with permission from Dr Stephen Morey



3.11.7 Word/Sign Boundaries in Sign Language

Zeshan (2002, p. 154) notes that the term used in sign languages is 'sign' rather than 'word' and questions whether this is simply a terminology issue or whether this reflects the difference between the notions of words in sign languages and spoken languages. Zeshan (2002) and Shwager and Zeshan (2008) argue that the sign is a cultural and psycholinguistic reality for signers and that signers perceive signs as equivalent to that of words in spoken languages. In Zeshan's (2002, pp. 161-167) investigation of the word in sign language, she shows that it is possible to identify even compound forms and pronominal clitics as phonological units, i.e. words.

Segmentation and recognition of words naturally also occurs in sign languages where native signers also have an intuitive knowledge of an extractable unit, 'the word/sign', from a stretch of signing (Orfanidou et al., 2010). During this flow of signing, transitional movements and other phonological assimilations occur, such that the phonetic reality of a sign in continuous signing is different to the same sign signed in isolation (Schembri & Johnston, 2007). Native signers of a given language share a psychological reality of what a sign/word is in their language, in the same way that speakers of a speech community do (Section 5.1.1). In order to acquire the native sign language lexicon, segmentation of signs/words from the flow of signing is expected to occur at some point:

> In spite of the radical modality differences, the perceiver (the sign comprehender or listener) must segment a discrete sequence of lexical units out of a quasi-continuous input which unfolds over time.

> It is possible, therefore, that the same segmentation procedures are applied across modalities. If this could be shown, then it would be possible to posit language-general segmentation processes rather than those which are limited to speech. (Orfanidou et al., 2010, p. 273)

Research has been carried out in sign language segmentation. Very recently and for the first time ever, research into the phonetic cues for BSL (British Sign Language) word segmentation in continuous signing took place (Orfandouri, Adam, McQueen & Morgan, 2009). Brentari, González, Seidl, and Wilbur (2011) also carried out work on prosodic cues in signers and nonsigners. Brentari and her colleagues compared the perceptions of signers and nonsigners in the segmentation of signs. Their results indicate that signers are more attentive to handshape cues in word segmentation than nonsigners. Their findings also point to differences in word segmentation during speech and signing since the cues are set in a different medium, the latter cues are visible and the former auditory:

> Brentari suggests that there is a difference in word segmentation strategies in signed and spoken languages due to the nature of the signal and the resulting Prosodic Word-level phonotactics. In other words, modality effects are present because the structure of sign language is more simultaneous, while speech is more sequential. (Brentari et al. 2011, p. 8)

In another study by Orfanidou, Adam, McQueen, and Morgan (2009) nonsense BSL words were presented to three different groups of signers, grouped according to their age of BSL acquisition. The results of their study shed light on the cues signers use to find the boundaries of lexical units, or words/signs.

Orfanidou et al. (2009, p. 305) note that similar to spoken language, one process of sign language recognition involves sensitivity to the phonotactic structure of signs:

> Sign languages also have systems of phonotactic constraints which determine possible combinations of handshapes, movements and location changes. For example, all well-formed signs must have a movement, just as spoken words have syllabic nuclei. (Orfanidou et al., 2010, p. 273).

The study carried out by Orfanidou et al. (2009) specifically analysed BSL recognition. Different sign languages may have different phonotactic rules and thus different phonotactic cues are expected for the different sign languages.

3.12 CONCLUSION

In this chapter a review of the main classification of writing systems was carried out (Section 3.3-3.5) and the available literature regarding the classification of SW as a writing system was reviewed (Section 3.6). Literature on SW as an orthography and related issues were reviewed in Section 3.8. Other notation systems for sign language were reviewed in Section 3.7. A brief synthesis of the cognitive processes

involved in reading and writing was carried out in Section 3.10 and this lead to the literature concerning word/sign boundaries that was reviewed in Section 3.11.

3.12.1 Research Questions 1-8

From the literature reviewed in this chapter the following research questions have been derived:

1. How many SW glyphs are used for the writing of LSM? (Section 11.2.1)

2. Are all the glyphs identified in the LSM texts required or can they be further reduced? (Section 11.2.2)

3. Is the smile glyph considered to be important for the LSM Deaf SW users? (Section 11.2.3)

4. How can the representation of space using SW, as found in the LSM SW texts, be modified to eliminate the ambiguity that arises in the SW of pointing signs and related issues of agreement in LSM? (Section 11.2.4).

5. Are the LSM texts unclear at times because of the redundant use of SW glyphs in LSM spellings? (Section 11.2.5)

6. Are head-tilt markers of prosodic patterns required for the writing of LSM? (Section 11.2.6)

7. Do the Deaf LSM signers perceive a sign-box as the marker of an individual LSM sign? (Section 11.2.7)

8. Can a list of final recommendations for writing LSM that would lead to a manual for the writing of LSM be created? (Section 11.2.8)

CHAPTER 4: LITERATURE REVIEW: AN OVERVIEW OF THE GRAMMAR OF SIGN LANGUAGES

4.1 INTRODUCTION

In this chapter an overview of the grammar of sign language is carried out. In Section 4.2 duality of patterning is considered in relation to the challenge of iconicity of sign language. In Section 4.3-4.9 literature concerning different verbs of sign language is reviewed. In Section 4.10 literature in LSM linguistics is reviewed.

4.2 SIGN LANGUAGE AND DUALITY OF PATTERNING

Duality of patterning is generally understood to be an important characteristic that distinguishes language from other communication systems (Hockett, 1959). Duality of patterning refers to the characteristic of spoken languages where a finite set of meaningless units combine to form meaningful units.

4.2.1 Meaningless Building Blocks of Signs?

What exactly constitutes the meaningless level of sign languages is not as straightforward as it is for languages that use the auditory medium. In the visible medium, the meaningless units are visible. Our visual perception naturally perceives any differences between two meaningless visible entities and this relative difference that is observed is itself meaningful. For instance, if there are two tables and we are looking at them, we perceive one bigger than the other. The same is observed in meaningless handshapes, meaningless body locations, and meaningless movement.

Since articulation involved in sign language is visible it cannot be entirely meaningless, e.g. a B-handshape in contrast to an O-handshape contains the appearance of flatness etc. (see also Section 4.2.3).

Stokoe (1960) analysed a sign for the first time as involving meaningless units from the parameters of location, handshape and movement (tab, dez and sig).

Despite the consensus regarding the importance of parameters location, handshape and movement in the representation of a sign, the way these parameters relate to one other at the segmental and syllabic level of the sign is notstraightforward. Sandler (1989) believes that location and movement should be grouped together and handshape set apart, whilst Brentari (1990; 1998) suggests that location and handshape are grouped together and movement set apart. Orfanidou et al's (2009) found that the most salient feature perceived in sign language is the location. They carried out a study where they produced nonsense signs and asked BSL signers to repeat the signs. They claim that their results show that the signers produced less errors in location than in handshape and movements, thus their conclusion of location being the most salient parameter of the sign. However their conclusion may need further investigation.

4.2.2 Simultaneous or Sequential organization of units that form signs?

The first analysis of an ASL sign (Stokoe, Casterline & Croneberg, 1976) described three simultaneous components in the make-up of a sign. These were handshape, location and movement and each component is capable of lexical contrast. The view that the components of a sign are simultaneous was adopted also by Klima and

Bellugi (1979, p. 43). An LSM sign can be minimally contrastive at handshape level, e.g. ISEM (NAME) vs. KUNJOM (SURNAME). Movement can also be minimally contrastive as in the LSM signs CL-PERSUNA TELA' (CL-PERSON GO UP) vs. CL-PERSUNA NIŻEL (CL-PERSON GO DOWN). The LSM signs show that location is contrastive in the signs RABAT (TIE) vs. RABAT-BARNUŻA (TIE HOOD).

All researchers that followed built upon this work (Schembri, 2001, p. 21), adding further parameters, such as handshape orientation (Battison, 1978), contact (Brennan, 1990) and dynamics of movement such as stress, duration, rate and repetition of movement (Coulter and Anderson, 1993).

Liddell (1984) moved away from the view of simultaneity of a sign on the grounds that a sign can be analysed as consisting of sequentiality in a series of hold-movement patterns (Liddell & Johnson, 1989). Rather than understanding a handshape, location or movement unit as being phonemic, Liddell (1984) argued that the whole segment is a unit in ASL that functions as the phoneme.

A segment is defined by Channon (2002) as:

> A unit of time in a phonological representation with only temporally noncontrastive, or structurally unordered, features. Equivalently: A unit of time where combinations of features are contrastive, but permutations and repetitions of features are not. (p. 31)

The analysis of the sequential nature of signs lead researchers to propose that a sign is made up of a number of segments (multi-segments) (cf. Brentari 1998; Van der

Hulst, 2000; Liddell & Johnson, 1989; Perlmutter, 1992; Sandler, 1996). However Channon (2002, p. 3) argued that all signs (except compounds) are single segments thus the structure of the sign is simultaneous. Sequentiality observed in signs is a result of one of the 'dynamics' feature of the sign, e.g. the feature of repeated movement (p. 53). Channon (2002) argued that signs do not have structural sequence. Rather all signs are all made up of one segment and limited sequences are handled by different dynamic features.

> The only difference between the single and multiple segment representations used here is that in the multisegment representation, both combinations and permutations of features can be contrastive (so that if ab, ba, aab and abc exist, they are all distinct), while in a single segment representation, only feature combinations are contrastive (ab = ba = aab, but abc remains distinct). It is because this is the only difference that the arguments given here can apply to any representation, because any representation must either allow or not allow contrastive permutations and repetitions (Channon, 2002, p. 4)

Channon (2002, pp. 3-4) argued against the multisegment analysis of a sign (Multiseg) on the basis that Multiseg overgenerates and produces two types of signs that should occur but never do, such as a sign that includes a double-contact at one location and a single-contact at another. Multiseg also predicts bundles of features that are contrastive when they are not, e.g. the number of times a sign is repeated is considered contrastive by Multiseg, whereas Channon's (2002) Oneseg analysis sees

repetition as a feature [repeat] and does not indicate how many times the sign is repeated, since the number of repetitions is not considered to be contrastive in ASL. In the LSM signs MAMA' (MUM) or PAPA' (DAD) the number of repeated contact of handshape on the cheek is not contrastive, however Multiseg overgenerates these as contrastive.

A multisegment analysis of signs overgenerates to analyse segments that vary in their beginning and end locations as contrastive, however this is not contrastive for mono-morphemic signs in LSM. For instance the LSM sign SPTAR (HOSPITAL) (Azzopardi-Alexander, 2004, p. 51) could be signed in two different ways: starting with contact on the right side of the chest and moving to the left  , or starting on the left side and moving to the right  . However such a difference is not contrastive in mono-morphemic LSM signs. Other LSM examples are EĠITTU (EGYPT) and POLONJA (POLAND).

The problem with OneSeg however concerns the analysis of verbal inflections, such as agreement verbs. Unlike verbs that are mono-morphemic the beginning and end positions are contrastive (see Section 4.9). Although Oneseg analysis can account for many inflections, Channon (2002) realises that the behaviour of classifier verbs and agreement verbs cannot be handled by the analysis of the sign as one-segment (see Sections 4.5 and 4.9). A proposal to a solution to this is given in Section 4.2.3.

4.2.3 Lexical and Predictable Iconicity (Channon, 2002)

Channon (2002) distinguishes between two different types of iconicity in ASL. One type of iconicity is language specific, where for e.g. the LSM sign for TUFFIEĦA (APPLE) consists of a handshape that is iconic of the grip of the hand on an apple, and a movement near the mouth that resembles the biting of an apple. This is language-specific and users of LSM share knowledge of this information. Channon (2002) calls this 'lexical iconicity'.

There is however another type of iconicity that is not language-specific and that can be understood by different SL users and even non-users of sign language. In classifier verbs the movements parallel real-life movement, so if a CL-VETTURA (CL-VEHICLE) moves up in a spiral way, the B-handshape representing the vehicle moves up in a spiral way. Channon (2002) names this 'predictable iconicity'.

Liddell (2000, p. 313) claims that in agreement verbs (that he calls 'indicating verbs') the directionality is unlimited, and he further states that no phonological framework has yet been created that can account for the unlimited directionality of agreement verbs. Channon (2002, p. 119) adopts Liddell's analysis of these verbs as unlimited in their movement directions, and thus analyses these verbs as consisting of 'predictable' iconicity.

If agreement verbs do not display predictable iconicity then they are a serious challenge to Channon's (2002) proposal of Oneseg of signs. Here a solution is proposed. This solution has been identified by Channon (2002, p. 133) in her argument that compound signs may be perceived as two signs, i.e. poly-morphemic:

> (…) affixes and compounds are multiple segments and (…) because signs are single segments, these anomalous forms with two segments are only weakly joined as a single word, and until they have been sufficiently modified to become a single segment, are likely to be perceived, and represented, as two separate signs, but more than one (p. 133).

Building on this argument 'single signs' would best be called 'mono-morphemic signs'. Thus Channon's (2002) theory that signs are single-segments would be adapted a little to claim that mono-morphemic signs are single-segments. On the basis of this adaption of the theory, agreement verbs are poly-morphemic and thus consist of more than one segment.

4.2.4 Phones and Distinctive Features

A 'phone' is defined as "the smallest perceptible discrete segment of sound in a stream of speech (...). From the viewpoint of segmental phonology, phones are the physical realization of phonemes; phonic varieties of a phoneme are referred to as allophones." (Crystal, 2011, p. 361).

In spoken languages phones are usually made up of a bundle of features, e.g. the phone [p] consists of the articulatory features 'labial' 'unaspirated' 'stop'. Since sign language is visible, the articulatory features are visible and thus very often the phone is equivalent to the articulatory feature, since a feature can be the smallest visible perceptible segment in a stream of signing. This explains why some researchers

have classified SW as an alphabet, while others as a featural system (see Section 3.6), because the line between a phone and a feature in sign language is very thin.

Locations such as the head-glyph and shoulders glyph, and all movement glyphs of SW represent both phones and features. SW handshape glyphs howeververy often represent a bundle of features, since they represent the configuration, the rotation and orientation of the hand (see Section 2.3.2). Thus some SW glyphs sometimes represent a bundle of features, while others do not. On the basis of this SW as a general writing system for sign languages is classified as a featural system (see Section 2.3.2). If it turns out that a specific sign language uses SW graphemically (i.e. each glyph represents a phoneme of that language,then 1) the SW glyphs can be called 'graphemes' and 2) SW as evolved for the writing of a specific language may be defined as an alphabet rather than a featural system.

4.2.5 Problems with minimal-pair analysis: A phoneme and iconicity conflict

One problem with coming up with phoneme inventories for sign languages is the large number of phonemes that seem to be involved in a given sign language. Schembri (2001, p. 19) described 34 distinct hand configurations for Auslan, however, the numbers of phonemes from other parameters are not counted. Schembri adds that there is an enormous amount of possible configurations for the other parameters and does not give a number, stating only that for the loci (configuration of location) the number of possibilities are limited to the signing space. As for movements, Schembri claims that there is a finite set of hand, arm and finger movements for Auslan but gives no numbers or lists.

There seems to be many more phonemes involved in a sign language than a spoken language. Crasborn, Van der Hulst and van der Kooij (2000, p. 15) claim that the reason for this may be due to the difference in modality. Since sign language is a visual language iconicity is much more prevalent. The iconicity may be accountable for the much higher number of phonemes:

> The problem with iconicity is that its demands seem in conflict with the demands of phonological compositionality because compositionality is based on having a limited list of discrete (digital) building blocks and combination rules, while iconicity is based on having holistic and essentially non-discrete (analog) forms that represent a concept or meaning. (…) The phenomenon of iconicity can quite easily lead to an undesirable increase of phonological building blocks. So how do we account for iconicity without increasing the set of building blocks beyond control. (Crasborn, Van der Hulst & van der Kooij, 2000, p. 15)

Crasborn et al. (2000, p. 15) come up with a proposal that treats the iconicity of a sign language as phonetic rather than phonological. Iconic features are not void of meaning and in calling them 'phonetic' it may seem misleading because phonetic features in spoken languages are void of meaning. However since the phonetic aspects of a sign language are visible, they are not necessarily void of meaning.

> The reason why features that have been proposed in the literature are so extensive, and the related reason why it seems difficult to find minimal

> pairs for all, or even most of them, seems to be that many phonetic distinctions that are really due to iconicity have been taken to point to distinctions that are potentially contrastive. One cannot, on the other, hand simply ignore iconic properties because they are obligatory and thus must somehow be encoded in their lexical representation. The proposal that is adopted here is that iconic properties are represented as lexically specified phonetic implementation (Crasborn, Van der Hulst & van der Kooij, 2000, p. 15).

Channon (2002) also points out that it is difficult to decide where to place iconicity in the structural levels of grammar: “Is it possible that predictable iconicity is syntactic, yet not a part of the phonology? Or perhaps the traditional distinctions of phonology, morphology and syntax must be broadened to add iconicity as a fourth element of the grammar.” (p. 122)

From the literature here the following research question is asked: Can a grapheme-set be derived from the LSM texts or is there a challenge with the status of certain glyphs? (Sections 8.5, 8.10)

Crasborn et al. (2000) notices that another challenge concerning the research of sign language phoneme inventories is that most sign languages do not yet have a standard written form, and thus the phoneme inventory is open to change at a much faster rate than those languages that do have a written form:

> A further effect, we believe, may derive from the fact that sign languages have no accepted and widely used written form. Many

> spoken languages do, and we know that writing has a conserving effect on phonologies, including their arbitrary aspects. It stimulates keeping phonologies 'unnatural' and protects alternations from being leveled out by analogical forces. (Crasborn, Van der Hulst & van der Kooij, 2000, p. 14)

The research question that is derived from the review of the literature in Section 4.2 is as follows: How can an SW orthography of a sign language account for predictable iconicity of LSM, since predictable iconicity claims that there are innumerable movement possibilities? (see Section 9.10.3).

4.3 PLAIN, AGREEMENT AND SPATIAL VERBS

Padden's (1988) classical work on verbal morphology has been adopted for the classification of verbs for other sign languages (cf. Meir, 1998). It is also used in this work to classify the different types of verbs found in LSM and create a structure for the analysis of the written data of LSM verbs. While Padden's work is drawn on ASL, Meir (1998) observes that the classification is valid for Israeli Sign Language and hypothesises that it may be valid for other SLs. The researcher here concurs with Meir's observation and claims that Padden's framework and description of verbal categories also holds for LSM.

Padden (1983) groups ASL verbs into three different classes on the basis of their different morphological inflections. Primarily she names the different classes 'Plain Verbs', 'Inflecting Verbs' and 'Spatial Verbs'. Johnson and Liddell (1987) suggests the

name ‘Agreement Verbs’ instead of ‘Inflecting Verbs’, which may be misleading. Padden (1990) concurs that the term ‘inflecting verb’ may be misleading and adopts the term ‘agreement’ for her classification of verbs. The reason for the change of the term ‘inflecting verbs’ is that WE classifier could be analysed as having aspectual inflections and thus the term could be misleading.

In this work the term ‘plain verb’ is used for verbs that do not seem to be modified. The term ‘agreement verbs’ (Section is used to refer to verbs that are modified for pronominal reference. ‘Spatial verbs’ refer to a Whole Entity Classifier Verbs (Section 4.4)

4.3.1 Inflection or Sign Modification

Schembri and Johnston (2007, p. 124) use the terms ‘sign formation’ instead of the term ‘derivation morphology’ and ‘sign modification’ instead of ‘inflectional morphology’ of signs. They also avoid terms such as ‘nouns’ and ‘verbs’. Their avoidance of such terms is understandable, since the use of such terms often presumes that the distinction between them in the sign linguistic research of a specific sign language has been established. Thus Schembri and Johnston (2007) are careful not to be misled by the adoption of these terms.

Although this cautious decision is appreciated, the traditional linguistic terms of ‘inflection’, ’morphology’, ‘morpho-phonology’ and so on are used in this work to describe linguistic phenomena in the visible medium of LSM that parallel linguistic phenomena that are well established for spoken languages. The traditional linguistic terms used thus retain their different traditional definitions, unless otherwise stated

or defined. Many researchers in the field of sign linguistics also use these classical traditional terms for the descriptions of their sign languages (cf. Brentari, 2010; Padden, 1988; 1990; Meir, 1998; Meir, Sandler, Padden & Aronoff, 2010). These scholars are followed here in their choice of terminology for studies in sign linguistics.

4.4 CLASSIFIER VERBS

In sign languages there is a class of handshapes that behaves differently to other handshapes. These handshapes are morpho-phonemic in nature, where the handshape is both a morpheme and a phoneme. Theyare loosely referred to as 'classifiers' in sign linguistic tradition (Schembri, 2003). Other terms have been used to refer to classifiers (see Figure 4.1). This information is based on Schembri's (2003, p. 4) synthesis of terminology in this area.

Figure 4. 1: Synthesis of terminology for classifiers adapted from Schembri (2003, p. 4)

Terminology	Authors
Classifier signs / Classifiers	Branson et al. (1995)
Classifier verbs	Supalla (1986); Channon (2002)
Verbs of motion and location	Supalla (1990)
Classifier predicates	Corazza (1990); Schick (1990); Smith (1990); Valli & Lucas (1995)
Spatial-locative predicates	Liddell & Johnson (1987)
Polymorphemic predicates	Collins-Ahlgren (1990); Wallin, 1990
Polysynthetic signs	Takkinen (1996); Wallin (1996; 1998; 2000)
Productive signs	Brennan (1992), Wallin (1998)
Polycomponential signs	Slobin et al. (2000); Schembri (2003)
Polymorphemic verbs	Engberg-Pedersen (1993)

The term adopted in this study is that of 'classifier verbs' (Supalla, 1986; Channon, 2002) (see Section 7.5.3 and 7.6).

4.4.1 The Function of the Classifier Handshape

Allan (1977, p. 285) states that in spoken languages a classifier is a morpheme and that it contains meaning of some salient feature of the referent. The function of classifiers in spoken languages is to categorize the world around us: "Classifiers serve to organize human knowledge into classes according to the principles of human perception and human functioning" (Aikhenvald, 2003a, p. 319). Grinevald (2000) also claims that the function of classifier handshapes is that of classification, but comes up with several different types of classifications (Grinevald, 2000, p. 50) based on morpho-syntactic properties.

Schembri (2003, p. 25) states that the primary function of the handshape does not seem to be classification but rather representation. Edmondson (2000, p. 10) also argues that the handshape classifier should be seen as a 'reference marker'. Klima and Bellugi (1979, p. 13) describe classifier handshapes as having a pronominal function. Zwisterlood (2003, p. 61) describes classifier handshapes as functioning as 'agreement markers'.

4.4.2 Categorizing Classifier Handshapes

A great deal of research on classifier handshapes has focussed on categorizing the different types of handshapes. Schembri (2003, p. 9) points out that there is lack of agreement between researchers on how many different subclasses of classifier handshapes actually exist and that this creates a problem for cross-linguistic

comparison. Researchers have grouped such handshapes according to what they classify semantically. In sign linguistic research the trend has been to group different classifier handshapes according to their different morphological/syntactic behaviour.

Here I will not be accounting for all the different categorizations of classifier handshapes. For an exhaustive list and discussion on the sub-categories of handshape classification the reader should refer to Schembri (2001). A general outline of the most important works is presented in Figure 4.2 adapted from Schembri (2003, pp. 9-10):

Figure 4. 2: Synthesis of different categorization of classifiers adapted from Schembri, 2003, pp. 9-10

Author	Different Classifiers
Wallin (1996); Zwisterlood (2003)	1. Objects 2. Handling of Objects
Schembri (2001); Schick (1990)	1. Whole Entity (WE-Class) 2. Size & Shape Specifier (SSS) 3. Handle (HANDLE) classifier
Engberd-Pedersen (1993)	1. Whole Entity (WE-Class) 2. Limb 3. Handle 4. Extent
Supalla (1982)	1. Shape Specifier 2. Semantic classifiers 3. Body classifiers 4. Body Part classifiers 5. Instrument classifiers
Corazza (1990)	1. Grab 2. Surface 3. Quality 4. Descriptive 5. Perimeter
Brennan (1992)	1. Size & Shape specifiers (SSS) 2. Tracing 3. Handling 4. Instrumental 5. Touch
Liddell and Johnson (1987)	1. Whole Entity 2. Surface 3. Instrumental 4. Depth and Width 5. Extent 5. Perimeter-Shape 6. Surface-On morphemes 7. On Surface

The different classes of classifier handshapes (Figure 4.2) reflect the handshapes' semantic and/or visual-geometrical features. Additionally, each class of classifier handshapes has diverse morphosyntactic behaviour (Schick, 1990, p. 17).

Galea (2006) described a three-way categorisation for LSM, based on Schick's (1990) and Schembri's (2001) work. Hence, the three main categories of classifier handshapes in LSM are 'Whole Entity' (WE-Class), 'Size and Shape Specifier' (SSS-Class) and 'Handle' (HANDLE-Class) classifier handshapes (Galea, 2006).

4.5 WHOLE ENTITY (WE) CLASSIFIER VERBS

Whole Entity (WE) classifiers are handshapes that represent whole 3D entities. Handshapes in this category are free to move in the signing space and the movement parallels real-life movement. In fact Liddell (2003b) describes these WE-Class forms as non-linguistic in nature. He claims that these forms act as 'puppets' in the signing space that during the signing of the WE-Class forms, represents a 'stage'.

4.5.1 An Orientated WE Classifier Handshape

Cokely and Baker (1980) pointed out that it is not the WE classifier handshape alone that carries the meaning but the orientated handshape. In LSM a B-handshape palm facing down is a classifier for CL-VETTURA (CL-VEHICLE), while a B-handshape palm facing upwards refers to CL-VETTURA TAL-BAĦAR (CL-SEA VESSEL). SW handshape glyphs contain information about the orientation of the palm. Supalla (1982, p. 42), Wallin (1990, p. 142), and Zwisterlood (2003, p. 123) treat the orientation of

classifier handshapes as morphemic, since palm orientation represents the bearing of the referent. Thus a SW handshape glyph may also contain morphemic information.

Supalla (1982) also argued that the handshape itself may contain internal structure. He analyses every meaningful section of the handshape as being morphemic. Wallin (1990, p. 143) also analysed the meaning of parts of the classifier handshapes as morphemic. According to their interpretation in LSM, CL-VEHICLE B-handshape palm facing down, and CL-UPRIGHT PERSON (INDEX) both have front and back morphemes within the handshape. The nail part of the finger in CL-UPRIGHT PERSON is a morpheme representing the back of the person, and the other side is another morpheme representing the UPRIGHT-PERSON's face.

Following Supalla (1982), Wallin (1990) and Zwisterlood (2003), Galea (2006) argued in favour of the morphemic analysis of LSM WE classifier handshapes. From the analysis of the data collected Galea (2006) found that for the signing of the LSM WE classifier verb CL-2 LEGGED-PERSON FALL OVER, the orientation of the palm must be facing up at the end position of the sign. If the palm was facing downwards it would carry a different meaning (CL-2 LEGGED-PERSON MOVE DOWN). This indicates that palm up vs. palm down may be minimally distinctive.

Liddell (2003a, p. 208) rejected the morphemic analysis of classifiers, stating that the hand-part meanings of classifier handshapes should not be interpreted as morphemic. This follows from his framework and theory of WE classifiers occurring as non-linguistic elements (2003). Liddell describes WE classifiers as a nuance of sign

language that have no comparison in spoken languages due to the difference of language mediums, i.e. visual vs. auditory.

4.5.2 Topographical Use of Space

Klima and Bellugi (1979) differentiate between two uses of the signing space: the grammatical and topographical use of space. Grammatical use of space is when the space is assigned referential points and verbs are directed towards these points (Klima & Bellugi, 1979, p. 276) (Section 4.9.1). Topographical use of space is when the signing space is used to show the spatial relationship between objects (Emmorey et al., 2002, p. 812). WE classifier handshapes seems to use space topographically. The handshape that represents a whole entity object creates a path movement that is iconic and meaningful in itself.

4.5.3 WE Classifier Verbs Movements

Supalla (1982) carried out a very thorough and detailed analysis of ASL and treated each movement as a morpheme, where the movement is the root of the verb and the handshape the affix. He also found certain rules operating on different groups of classifiers. He described 'path morphemes' as morphemes that carry the meaning of "move from point A to point B".

Supalla (1982) described basic ASL path movements consisting of 'forward-back' versus 'up-down'. He also describes 55 additional modifications to these basic movements. These modifications could be understood to be aspectual modifications of the path movements. Supalla (1990, p. 141) discovered that in ASL these path morphemes cannot be affixed to Handle and SSS classifiers. Here the question asked

is whether a pattern of movement glyphs exists for the writing of LSM WE classifier verbs.

Schick (1990, p. 17) described three types of movement morphemes: movement through space (MOV), movement that imitates real-world action (IMIT), and movement which consists of a single point in space (DOT). Schick (1990, pp. 19-32) then analysed WE, SSS and HANDLE classifier handshapes and found that SSS classifier verbs do not contain path movements. Galea (2006) found that in LSM SSS handshapes may consist of path movements.

Liddell (2003b, pp. 269-275) describes classifier verbs as a mixture of lexical features and gradient aspects that are meaningful in themselves (Liddell, 2003b, p. 269). Liddell distinguishes between the movements, e.g. up vs. forward and the manner of movement, e.g. bouncing vs. swirling and describes these as lexical (Liddell, 2003b p. 270). The points in space where the handshape starts and finishes its movement are seen as gradient and variable (Liddell, 2003b p. 271). In this work the different manners of the movement of WE classifier verbs are considered to be aspectual distinctions.

The research question asked here is as follows: If Whole Entity classifiers are non-linguistic in nature, as proposed by Liddell (2003b), how are the infinite possibilities of movement patterns to be accounted for by the LSM glyph-set?

An orthography consists of a list of choices that with use develop into a regular system of choices (see Section 3.2.2), but if WE classifier movements cannot be contained, how can choices and rules be established? Another researcher from the

field of computer translation to ASL decided to create a framework based on Supalla's (1986; 1990) analysis of classifiers. In adopting his work for computer translation he decided to disregard Liddell's framework on the basis of having no limit on the number of movements (Huenefauth, 2006).

4.6 SIZE AND SHAPE SPECIFIER (SSS) CLASSIFIERS

SSS-classifiers are handshapes that include visual-geometrical information. These handshapes then move to specify the size and shape of an object. An SSS-classifier handshape represents the surface shape of the entity and the SSS-classifier movement represents the outline of the shape. Schick (1990, p. 17) describes SSS-Class forms as adjectival.

4.7 HANDLE CLASSIFIER VERBS

HANDLE forms are representative of the actual handling (e.g. grasping or clutching) of an object. There are two types of HANDLE-Classifiers. The first type consists of a handshape that represents the actual grasp/hold of an object, whereas the other type consists of a handshape that represents the object grasped/held. The movements involved in both types of Handle classifiers mimic real-life movements.

For instance, there are two varieties of ĊEMPEL (PHONE-CALL) in LSM: 

(handshape represents grip of hand on the device) and  (handshape represents the device).

4.7.1 Handle vs. Locomotion Classifier Verbs

Supalla (1990, p. 130) differentiated between Handle classifier and Locomotion classifier Verbs. Handle classifier handshapes represent the grip on objects, e.g. IFTAH-BIEB (OPEN-DOOR) whereas locomotion verbs represent how the hands would be configured in real-life, e.g. GHAM (SWIM). In this work these two classes are treated as one on the basis that they appear to behave in the same way, where the movements of both verbs mimic the real-life movements involved. Supalla (1990) came to the conclusion that locomotion verbs do not have path morphemes attached to them.

4.7.2 Classifiers: 'Stage Mode' vs. 'Role-Play Mode'

Issues of non-manuals, iconicity and simultaneity in sign languages were avoided in the early days of sign linguistic research and this is evident in classifier literature. Liddell (2003a, p. 202) notes that the work of DeMatteo (1976) on visual analogues in American Sign Language did not receive a warm welcome. DeMatteo proposed that WE classifier handshapes could simply move around in space just like puppets on a stage, the stage being the signer's space.

Supalla's (1982) analysis was the opposite of DeMatteo's, where he analysed classifier constructions into complex morphological structures that are highly productive. However, although Supalla (1982) never talked about the possibility of such constructions being iconic in nature, he did recognise the fact that there are two ways of signing the same thing in ASL (Supalla, 1982, pp. 45-50). He referred to

this difference as ‘real’ versus ‘abstract’ reference systems. His examples show that he is talking about what is coined here as ‘stage’ and ‘role-play’ mode.

Schick (1990, pp. 32-36) also discusses this phenomena. She came to two conclusions: 1) that Handle classifier handshapes are always part of Role-Play Mode, and 2) that WE classifier handshapes are always found in Stage Mode. Pizzuto and Volterra (2001, p. 266) describe Italian Sign Language (LIS) as being made up of classifier, pantomimic, and language specific entities, where classifier and pantomimic aspects of LIS correspond to stage-mode and role-play mode. In this work the question asked is whether any markers have been included in the written form of LSM to distinguish between WE classifier verbs and Handle classifier verbs (Section 11.2.15).

4.8 PLAIN VERBS AND FROZEN SIGNS

Frozen signs are signs that may be constructed by different classifier handshapes and movements, but seem to be less subject to change than the rest of the other signs. Plain verbs are part of ‘frozen signs’.

In frozen signs, although classifier handshapes and movements may be identified, the morphemes are no longer functional and the originally poly-morphemic sign becomes mono-morphemic (Supalla, 1982, p. 63). Schick (1990, p. 18) follows Supalla (1982) and claims that the MOV (also known as path movement) is not present in frozen signs.

On the other hand Zwisterlood (2003, p. 26) questioned the status of frozen signs as being lexicalized. She argues that treating frozen signs as mono-morphemic does not explain why there are so many frozen signs in the language and furthermore why frozen signs appear to be productive.

In this work an attempt is made to answer the question how LSM plain verbs that are part of frozen signs are represented in SW (Section 7.5).

4.8.1 Plain Verbs

'Plain verbs' are uninflected verbs that are usually anchored to the body, such as SAQ (DRIVE), ĠERA (RUN) and ĦASEB (THINK). They are not modified for aspect like WE classifier verbs (Section 4.2.8), nor are they modified for pronominal reference like agreement verbs (Section 4.9). Meir et al. (2007) describe plain verbs as follows: "Plain verbs have invariant beginning and end points; in particular, the direction of the path movement of these verbs is not determined by the R-loci of their arguments." (R-loci meaning 'referential locations'). These verbs are usually fully anchored to the body and thus are not inflected by means of path movements or referential points in the signing space (Section 10.2). In other words, they are not inflected for person.

4.9 AGREEMENT VERBS

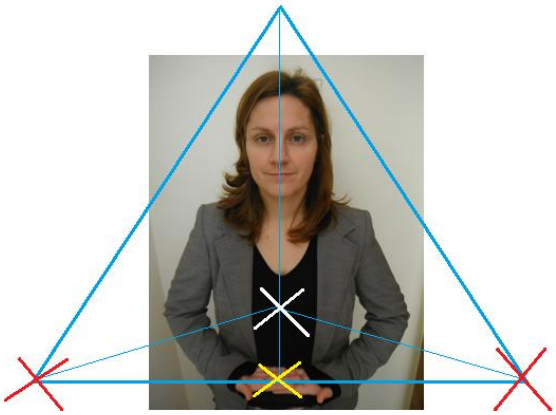
When a sign undergoes directional modification to incorporate locations associated with core arguments, it is known as an 'agreement verb' (Padden, 1983; Rathmann and Mathur, 2002; Meier, 2012) or 'indicating verb' (Liddell, 2003a, 2003b; de

Beuzeville et al., 2009). Sandler and Lillo-Martin (2006, p. 24) emphasise that before verb agreement description, it is necessary to understand the linguistic use of space in the sign language in question (Section 4.9.1). Many researchers claim that agreement verbs make use of the grammatical space. When the signing space is used grammatically a number of points in space are assigned different pronominal reference (cf. Klima & Bellugi, 1979). Agreement verbs then move to and fro the points and in doing so 'inflect' for person agreement. Liddell (1998; 2000; 2003b, p. 52) analyses the agreement verbs as gestural and non-linguistic. He claims that signer's conceptualise referents in their mental space. Schembri and Cormier (2009) also argue that these types of verbs do not consist of any 'agreement', building their argument of Liddell's (2003b) analysis of these verbs.

4.9.1 Grammatical use of space

LSM, like other sign languages, seems to make use of three distinct locations in the signing space. 1st, 2nd and 3rd person are marked by abstract points in the signing space (cf. Padden. 1990; see also Figure 4.3). The first point is at the chest area of the signer's body and this refers to first person, the second location is away from and linearly in front of the signer's body: this point marks second person. On the left and right side of the signer's body third location is away from the first and second points and thus marks two distinct 3rd persons left and right.

Figure 4. 3: Pronominal locations. Colour white: 1st person, yellow 2nd person, red 3rd person left and right.



Meir (1998) adapted Padden's (1988) work on the basis of disagreement about the number of spatial locations that mark person in ASL.

Meir (1998) argues for a two-way person distinction in ASL: first person and non-first person rather than three person distinctions. This disagreement is not simply based on the question of the number of pronominal locations but underlines the very nature of the pronominal points: whether they are linguistic (abstract/mental representations), gestural, or a blend of both.

Meir (1998) observed that Padden's (1990) 2nd and 3rd pronominal points share a common reality, i.e. they are located *away from* the 1st person point, which is the signer's body. Her claim is that since Padden's (1990) 2nd and 3rd pronominal points share this reality, then they should be analysed as the same pronominal point. It is not clear whether Meir (1998) and Padden (1990) are talking about the same phenomenon. Meir (1998) appears to be describing the phonetic reality of pronominal points, while Padden (1990) accounts for the morpho-phonological

reality of pronominal points, i.e. the shared mental/abstract realization in the mind of signers who share the same sign language.

The basis of Liddell's (2003b, p. 75) argument against agreement verbs can be seen summarized by an example he provides in his work. The ASL verb ASK moves to different points in the signing space, depending on the height of the addressee. Liddell argues that this proves that the ASL verb ASK does not inflect to the referential point 2nd person but rather changes its direction depending of the height of the addressee. This seems to occur in LSM. Liddell thus adopts the term 'depicting verbs' instead of 'agreement verbs' (see Section 4.3). Here it is argued that Padden's 3-person points in space is valid and that the variations of the ASL verb ASK-you to the different height points is a phonetic feature rather than a morpho-phonological or lexical contrast.

Signers very often have objects and referents close at hand in the real world, thus they have the choice of pointing to points in real space where referents are positioned. These gestures of pointing are not abstract/mental representations in the same way that the pronominal points are. Pointing to real-life objects cannot be displaced in time and space. Although pointing to real-life objects occurs during signing, it does not imply that the abstract pronominal points as mental representations are no longer valid.

If the addressee is slightly to the left of the signer, when signing INTI-2PER-SG (YOU-2PER-SG)  naturally the signer will point or move signs towards the actual present location of the addressee. It is argued here that this reality is simply the phonetic realization of the INTI-2PER-SG. On the basis of such observations, Liddell (2000) and Meir (1998) concluded that pronouns are a blend of gesture and linguistic elements.

Although it is true that during signing there is often a mixture of gesture and linguistic elements, these are phonetic realisations of the target morpho-phonemes, i.e. the different pronominal points. Thus for instance INTI/YOU second person singular for LSM has a shared mental representation in the LSM signer's mind and this mental representation is a spatial point away and in front of the signer's body, irrespective of where the addressee is standing physically in space.

If Liddell's (2000) proposal is correct, it would imply that if the signer is signing lying horizontally in bed it would mean that all the signs change form simply because of the relative position of the real-world and the signer. If the signer was hanging upside-down all the sign would change form once again. Additionally it would mean that the transfer of sign language into writing and 2D paper would be impossible due to the non-constant nature of signs.

4.9.2 Regular and Backwards Agreement Verbs

Meir (1998) identifies two different types of agreement verbs: regular and backwards verbs. She notes that the different behavioural patterns of these two different types of verbs clarify how syntactic and thematic relations of the constituents in a signed sentence are realised.

Meir (1998, p. 2) describes regular agreement verbs as "consisting of a linear movement (path movement) on the horizontal plane, with agreement markers for subject (S) and object (O) on either ends: the beginning point of the sign is the S-agreement marker, and the end point — the O agreement marker."

On the other hand backward verbs are described as follows:

> Backwards verbs (…) are characterized by reverse agreement morphology, i.e. by a path movement that originates at the locus of the object, and ends at the locus of the subject. Semantically, they also seem to have something in common: the subject of backwards verbs is understood to be the **goal** in some sense, while the object is associated with the notion of **source.** (Meir, 1998, p. 8)

Backward verbs are very often anchor-final verbs (Johnston & Schembri, 2007), where the hands are anchored at final position on or close to the signer's body. An example of a regular agreement verb in LSM is the verb TA (GIVE). If this verb starts at the point on the right of the signer (3rd person) and ends with contact on the signer's body/chest (3PER-SG AGꟾTI (GIVE)1 PER-SG) the starting point 3-PER would be subject/agent and end point 1-per the indirect object. If the path movement is

reversed and the start point of the sign is at point 1-PER and ends at point 3-PER, then 1-PER is subject and 3-PER indirect object.

The peculiar behaviour of backward signs is resolved by more recent research carried out by Meir et al. (2007) who came up with a solution to this puzzle on consideration of the role of the signer's body in the lexical composition of signs. The solution to the puzzle provided by Meir et al. (2007) is linked to the iconic/lexical nature of signs. Meir et al. (2007) claim that the signer's body is the lexical subject. Thus the path movement of a verb in relation to the signer's body is naturally visible/iconic and meaningful: hence this *relationship* is part of the lexical composition. In other words all backward verbs are anchor-final verbs that are anchored to the signer's body location.

The LSM verb LAQA' (WELCOME) is a backward verb since the lexical structure of LAQA' (WELCOME) consists of movement towards the signer's body. The backward movement is a crucial element in the lexical composition of the sign LAQA' (WELCOME). On the other hand the path movement of the LSM verb TA (GIVE) is away from the signer's body. The body is the lexical subject/agent in both examples and thus the differing meanings between these two verbs arises from the movement away or towards this lexical subject/agent.

From the literature reviewed in this section the question asked is how are regular and backward agreement verbs represented using SW? How can person locations that are involved in agreement verbs be represented using SW? (see Section 11.2.17).

4.9.3 Pointing signs within the Agreement Debate

"The 'pointing' analysis within the agreement debate is equally relevant for an understanding of pointing more generally within sign languages." (Cormier, Schembri & Woll, 2013, p. 232).

Pointing signs are still a puzzle in sign linguistic research. Three functions of pointing signs that have been described by Cormier et al. (2013, p. 232) are pronominal, adverbial (i.e., locative), and determiner functions. There seems to be a fine line between the functions of locative and determiner. Cormier et al. (2013) describe the determiner function as linked to nouns in establishing referential locations, while the locative function linked to the pointing of physical spaces. However, the locatives HERE/THERE seem to be identical to the determiners THIS/THAT. Cormier et al. (2013) are aware of these challenges of pointing signs and they claim that all pointing signs are ambiguous.

4.9.4 Syntactic and/or semantic pronominal points

> It has been a matter of controversy as to whether the agreement affixes attached to agreement verbs are best described as corresponding to syntactic notions such as **subject** and **object**, or as reflecting semantic/thematic notions, such as **source** and **goal**. In this paper I will claim that agreement verbs in ISL (and apparently other SLs) exhibit morphological marking of both syntactic **and** semantic/thematic structure, by using two different mechanisms

> available in the language: the direction of the path movement, and the facing of the hand(s). (Meir,1998, pp. 1-2)

In several spoken languages the difference between subject and object pronouns are marked by different forms. For instance in English 1st person subject is represented by *'I'* whereas 1st person object by '*me*'. In LSM the same form (i.e. point in space) represents the object and subject pronouns. The syntactic relationship between subject and object in LSM concurs with Meir's (1998, p. 2) observation for Israeli Sign Language (ISL), i.e. that the syntactic and semantic relationship of the constituents in a sentence results from 1) the direction of the path movement of the verb and 2) whether the verb is a regular verb or a backward verb.

Meir et al. (2007, p. 19) clarify a little the 'direction of the path movement' by adding that the start and end point of the verb are fundamental. Here it is claimed that furthermore what is fundamental is the start and end points of the path movement *in relation to the signer's body* that determine the syntactic and semantic relationship. Meir et al. (2007) elaborate on the function of the signer's body as lexical subject and this is discussed in further detail in Section 4.9.5.

To fully understand the range of different types of verbs that are part of the agreement verb category it is necessary to understand Meir et al.'s (2007) description of the signer's body as part of the lexical structure of these verbs and additionally Meir's (1998) distinction between regular and backward agreement verbs.

4.9.5 The signer's body as lexical subject

Meir et al. (2007) have identified that the position of the hands *in relation* to the signer's body is a fundamental part of the lexical structure of signs in ASL, ISL (and ABSL. They describe the signer's body as acting as subject in sign language, not in the syntactic sense but rather the lexical sense. They claim that: "the lexicalization pattern of 'body as subject' (is) a basic strategy in the lexicon of sign languages" (Meir et al., 2007, p. 4). This is identical to an earlier description of the notion of subject by Williams (1984, p. 641). Williams described two notions of subjects. The first one is the syntactic subject and the second one is a lexical subject that he described as an 'external argument' with no restrictions on thematic roles.

Backward verbs reviewed in Section 4.9.2 are a group of signs whose handshape movements are anchored at final position on the signer's body. The signer's body in these backward verbs is the lexical subject.

4.10 LINGUISTICS OF LSM

Coulmas (2003) claims that the orthography of a language is a description of that language. In this section any descriptions available for LSM are reviewed. The works concerned with LSM linguistics are the LSM dictionary (Azzopardi-Alexander, 2003; 2004), Galea (2006)'s work on classifier verbs, Mifsud (2010)'s work on superordination and subordination in LSM and Azzopardi (2001)'s linguistic analysis of LSM that focuses mainly on the spoken component of LSM.

4.10.1 The LSM Dictionary (Azzopardi-Alexander, 2003; 2004)

The published LSM dictionary consists of two volumes 'Animals' and 'Places' (Azzopardi-Alexander, 2003; 2004). The primary purpose of the dictionary was to record the LSM signs that were used, so that signers could find ways to express themselves. However, the dictionary goes beyond this purpose and for the first time for LSM it provides explicit details and explanations of LSM signs that go beyond basic need signs. The volumes include signs that are used for rich language expression.

The LSM dictionary is trilingual and it consists of descriptions in Maltese and English. Each entry is also written in SW. The description for each entry goes beyond the description of the sign. It also includes descriptions for any variants of the sign, information of how the sign is modified in context, particularly how the plural form is expressed and how the sign is modified for large and small. Thus it contains information on LSM classifier handshapes.

In the first volume a list of LSM handshapes was created from the signs of animals. The list of LSM handshapes is as follows: A B Ċ F L O Q U V X Y and 1 2 4 5 8 (Azzopardi-Alexander, 2003, p. xvi). These handshapes also have the variations of curved and bent. A complete list of the curved and bent handshapes was not concluded from the work, since "We do not yet know if the difference is significant. We have tried to include all that we considered to be important. Thus, too though the difference between a curved and a bent shape is visually clear it may not be a significant difference." (Azzopardi-Alexander, 2003, p. xvii).

The following classifier handshapes have been identified from the descriptions of LSM signs in the LSM dictionary Azzopardi-Alexander (2003; 2004):

Curved V (e.g. p. 81 POODLE)

Closed-5 (e.g. p. 167, TRAFFIC)

Shape of 5 (e.g. PENGUIN, p. 78)

Curved 5 (e.g. p. 3, BULL)

Bent-5 (e.g. p. 83 OCTOPUS)

Curved-U (e.g. p. 92, SQUIRREL)

X-shape (e.g. p. 67, ANT)

Curved 8 (e.g. p. 19 TURKEY; p. 34)

Horizontal 1 (e.g. p. 35 HAMSTER)

1 diagonal (e.g. p. 89, SNAKE)

1 (e.g. p. 24, FLAMINGO)

Upright-1 (e.g. p. 143, FOLLOW)

Open-F (e.g. p. 101, WASP)

Ċ-closed fist (e.g. p. 7, JELLYFISH)

L-SHAPE (e.g. p. 169, SHIP)

Alexander-Azzopardi (2003, p. 15; p. 89) includes the descriptions of the orientations of handshapes, such as that of DOLPHIN where the handshape described is not a simple 5-shape hand but “5 held sideways” and for SNAKE where the shape of 1 is described “with palms facing the body diagonally”. In the second volume the sign WALK (to) is described with an upside-down V, with fingers pointing downwards. This is evidence of the importance of an orientated handshape classifier in LSM (see Section 4.2.3).

Some HANDLE classifier used in LSM signs have been identified in the LSM dictionary (2004), for example the closed fist can be found in the sign VENICE (p. 171) and KAROZZA (p. 82). The thumb and index grip can be found in MARSA (p. 102) and MECHANIC (p. 103). An open grip can be found in the sign HALL (p. 139). It is questioned whether these handle classifier distinctions are found in the LSM texts.

The LSM dictionary talks of signs rather specific parts of speech such as verbs and nouns. The distinction between noun and verb is not yet know in LSM. For instance the sign CAR (Azzopardi-Alexander, 2004, p. 82) and DRIVE (Azzopardi-Alexander, 2004, p. 142) are identical.

Azzopardi-Alexander (2003) also mentions the use of facial expressions in the dictionary and states that this aspect of LSM requires more research.

Like Brentari (1995, pp. 622-623) Azzopardi-Alexander (2003, p. xvi) uses the terms dominant vs. non-dominant hand rather than right and left hands (see Section 2.5). This convention is also used in this work. The right handed arrow glyph that is shaded black marks the dominant hand rather than the right hand.

4.10.2 Galea (2006) on LSM classifiers

Galea (2006) carried out work on LSM classifiers. A list of classifier handshapes that were found in WE, SSS and Handle classifier verbs can be seen in Figure 4.5. Galea (2006, p. 43) stresses that what is phonetic or phonological is still not known and that the difference between the O-hand and the C-hand and the 5-hand and the 4-hand may be phonetic, rather than phonological.

Figure 4. 4: The list of classifier handshapes of LSM, in Galea (2006, p. 232-236)

B	
B BENT	
B+ARM	
C	
C FORWARD	
BABY C	
BABY C FORWARD / BABY C FORWARD CLOSED	
OPEN C	
Y	
INDEX	
INDEX+ARM	
INDEX BENT / T	
5+ARM	
5	
5 FORWARD	
5 FORWARD+ARM	

5 BENT	
S	
S+ARM (WINGS)	
4 (PORCUPINE / 5 hand may be used instead)	
V	
H	
V BENT / H BENT	
8 BENT	
O	
A	
F	
OPEN F	
L	
G+ARM	
W	
DISCONTINUOUS 4	

Galea (2006) described three path movements for LSM classifier verbs: 1) Travel from point A to point B, 2) Fall/Tip over, 3) Be-at (no movement). She also identified the aspectual modifications of bounce, zigzag and diagonal.

Galea (2006) also questions what marks the difference between LSM WE, SSS and Handle classifiers, and suggest that non-manuals may be involved. One of Galea's (2006) conclusions is that classifiers need to be categorized according to the different behaviours of the verbs. Another question asked in Galea (2006) regards

further research that is required concerning any formal differences between nouns and verbs in LSM (see Section 7.2)

4.10.3 Mifsud (2010) on superordination and subordination in LSM

Mifsud (2010) collected LSM data from five participants for her Masters dissertation concerning superordination and subordination in LSM. The amount of data collected and analysed is very large and so her results are highly reliable and give a strong indication that that LSM users do differentiate between different levels of abstraction, i.e. between a superordinate-, a basic- and a subordinate level of abstraction.

In LSM the subordinate level is mostly lexicalised with the basic term and a specifier (Mifsud, 2010, p. 160). At times just a basic term is expressed. The basic level terms are expressed with one morpheme e.g. TUFFIEĦA (APPLE) and LARINĠA (ORANGE) (p. 156). Informants share a lot of basic level terms, however at the subordinate level they differ in their use of specifiers. The specifiers applied to the basic terms include LSM signs for colour, size and shape specifiers or a particular perceptual quality of the entity (Mifsud, 2010, p. 164), such as the sign POODLE is expressed by the basic term DOG and an index-finger that rotates at head level that specifies the type of curly fur of a poodle.

In LSM the superordinate level is generally expressed by coordinate lexical items of basic level signs or mono-morphemes (Mifsud, 2010, p. 152). A large number of superordinate expressions found in Mifsud's (2010, p. 157) data consist of compressed compound forms. For instance the compound TUFFIEĦA-LARINĠA-

BANANA (APPLE-ORANGE-BANANA) that expressed FROTT (FRUIT) is compressed to two morphemes TUFFIEĦA-BANANA.

Mifsud (2010, p. 160) also found that classifiers are used sometimes at the subordinate level and that their use causes ambiguity that can only be resolved by the context. She notes that for the signs FAŻOLA (BEANS), TEWM (GARLIC), KAPPAR (CAPERS) and ŻEBBUĠ (OLIVE), the thumb-index classifier handshape is used. Mifsud (2010, p. 160) argues that only the context can differentiate between the intended meanings of the use of this classifier.

Mifsud (2010, p. 173) also notes the problem with the definition of a phrasal structure in LSM. She concludes her work with a note for future research in LSM concerning the nature and distinction between verbs and nouns. She talks of the common use of the LSM sign UŻA (USE) that is part of a phrasal structure that is expressed for subordinate signs. She notes that since the Maltese word 'uża' is a verb, a researcher may be inclined to categorize the LSM sign as a verb, however this sign is probably not a verb at all in LSM (Mifsud, 2010, p. 152).

4.10.4 Azzopardi (2001): The spoken mouth-patterns in LSM

Azzopardi (2001) investigated this issue noted by Mifsud (2010) regarding the use of a classifier to refer to specific entities. Azzopardi's (2001) work consisted of a collection of the LSM data of two Deaf participants narrating stories to one another using LSM. All the data was transcribed into SW. She found that when two signs such as PRESEPJU (CRIB) and KNISJA (CHURCH) were identical, a mouth-pattern that

resembles the spoken Maltese word would disambiguate between the lexical signs (Azzopardi, 2001, Appendices, S115).

Azzopardi (2001) analysed all the mouth-patterns in the data she collected and her conclusion concerning these patterns was that the majority of these mouth-patterns are spoken components. The other common mouth-pattern is the 'intensifier' that consists of air blowing out of the mouth to express intensity.

The spoken mouth-patterns are widely used in LSM to distinguish between homonymous manual signs, however the spoken mouth-patterns do not contain any grammatical information and are not inflected in the same way that a Maltese speaker would use Maltese (Azzopardi, 2001, p. 53). For example a Deaf LSM user would not produce the following distinctions, 'nitlaq' (I leave) vs. 'titlaq' (she leaves), whereas a speaker of Maltese would (Azzopardi, 2001, p. 26). Rather the spoken component in LSM was analysed as being another parameter involved in the build-up of the lexical LSM sign. This was argued since a mouth-pattern that consists of a spoken word pattern is minimally contrastive, such as the difference between FENEK (RABBIT) vs. KELB (DOG), where the teeth biting the bottom lip represent the /f/ and this contrast with the tongue sticking out minimally that represents the /l/ in 'kelb'.

Mifsud (2010) noted that a general LSM classifier is used for the LSM signs TEWM (GARLIC) and FAŻOLA (BEANS), and it is argued here, following Azzopardi (2001) that it is highly likely that not just the context would differentiate between the intended meanings, but that the spoken component plays the most significant part in creating a contrast.

Bergeron (2004) also suggested the inclusion of spoken mouth pattern glyphs in the writing of signs to help with disambiguation of similar manual signs (see more Section 3.8.1.1).

4.11 CONCLUSION

In this chapter literature concerning the grammar of sign languages and LSM in particular was reviewed. In Section 4.2 issues relating to the duality of patterning and the challenge with the iconicity of sign languages were considered. In Sections 4.3-4.9 literature concerning different verbs in sign language was reviewed. Finally Section 4.10 consists of a review of the literature concerning the linguistics of LSM.

4.11.1 Research Questions 9-21

The following research questions start from number 9, since they continue from the research questions 1-8 that were derived from the literature reviewed in Chapter 3:

9. To have a workable glyph-set for the writing of LSM, does the orthography require the establishment of a grapheme-set that parallels the phoneme-inventory of LSM, or does a glyph-set that represents the phones involved in LSM suffice? (Section 11.2.9)

10. Can a grapheme-set be derived from the LSM texts or is there a challenge with the status of certain glyphs? (Section 11.2.10)

11. How can an SW orthography of a sign language account for predictable iconicity of LSM, since predictable iconicity claims that there are innumerable movement possibilities? (Section 11.2.11)

12. Can a pattern of movement glyphs be derived for the writing of LSM WE classifier verbs? (Section 11.2.12).

13. How are LSM WE classifiers represented in written form, and is the topographical use of space marked in writing in any way (Section 11.2.13)?

14. How are LSM handle (and locomotion) classifier verbs written using SW? (Section 11.2.14)

15. Are any markers included in the written form of LSM to distinguish between WE classifier verbs and Handle classifier verbs? (Section 11.2.15)

16. How are LSM plain verbs represented in SW? (Section 11.2.16)

17. How are regular and backward agreement verbs represented using SW? (Section 11.2.17) How can person locations that are involved in agreement verbs be represented using SW? (Section 10.5)

18. Are LSM pointing signs ambiguous also in written form, and does an attempt to disambiguate between the different pointing forms in writing contribute to the understanding of pointing signs in general? (Section 11.2.18)

19. Is any evidence in the LSM texts that reinforces Meir et al.'s (2007, p. 2) claim "that the subject argument is represented by the body and is part of the lexical structure of the verb"? (Section 11.2.19).

20. Can it be concluded whether the varying degree of openness of LSM handshapes, such as that noted by Azzopardi-Alexander (2003, p. 40) for FLYING INSECT is phonological or not? (Section 11.2.20)

21. Are facial expressions involved in direct discourse and do they need to be marked in writing? (Section 11.2.21)

4.11.2 Five Overriding Research Questions

Five overriding research questions that include these detailed research questions can be found here:

i. Can the LSM glyph-set be described? Can it be compared to other SL glyph-sets? (Chapter 8)

ii. Can an LSM grapheme-set be derived from the glyph-set, in order to establish bi-uniqueness where a grapheme represents a phoneme of LSM? (Section 11.3.4)

iii. Are LSM SW pointing signs ambiguous and how can abstract pronominal points be represented in SW to write LSM pronouns and related verbs? (Section 11.3.1)

v. How are LSM Whole Entity (WE) classifier verbs and plain/Handle verbs written in the LSM texts, and does their representation in SW provide a description of these linguistic aspects of LSM? (Section 11.3.2, Section 11.3.3, Section 11.3.4).

vi. What difficulties did the Deaf readers encounter when reading SW LSM with the focus on graphemes, pointing signs and verbs? (Section 11.3.1)

CHAPTER 5: METHODOLOGY

5.1 INTRODUCTION

The methodological approach of this work is primarily qualitative. In this chapter the methods used in an attempt to answer the research questions of this work are described (Sections 3.12.1, 4.11.1 and 4.11.2). A breakdown of the methods adopted in this work are 1) an analysis of SignPuddle 2.0 and the Malta Literature Puddle (Section 5.2), 2) A linguistic study of some aspects of LSM largely an analysis of LSM pronominals and different LSM verbs (Section 5.3), 3) An analysis of a number of LSM texts to understand how LSM has been represented using SW (Section 5.4), 4) The formulation of a questionnaire that involved the reading of LSM in order to observe and collect data related to Deaf readers' views regarding the written form of their language (Section 5.5), 5) An identification of ambiguous SW LSM spellings and an analysis leading to a way to eliminate ambiguity and other difficulties observed in reading.

5.2 AN ANALYSIS OF SIGNPUDDLE 2.0

In order to answer the research questions regarding the glyph-set of LSM, SignPuddle 2.0 was analysed. The LSM texts are found in the LMAP (Literature Malta Archive Puddle). This was analysed in order to arrive at the LSM glyph-set (Section 8.3). The analysis was aided by the symbol frequency tool (Section 8.2.1).

In order to answer the question regarding other glyph-sets for other SLs, the whole SignPuddle 2.0 was analysed. From the analysis, the ten largest Literature Puddles were identified (Section 8.2). Each literature Puddle was analysed and the glyph-sets compared (Section 8.4).

A further question was considered regarding the active literature puddles of other SL. Can the glyph-sets be reduced on the basis of them being used phonetically rather than phonologically? One way of answering this question was identified but was not chosen since it would have involved the knowledge of the different sign languages in question. Signers and SignWriters of these different languages may have been asked to participate in identifying glyphs that may be substituted for one another. This method was not pursued as it was beyond the scope of this work which focuses only on LSM. The symbol frequency tool was, however, used to look into whether there is an indication that the glyph-sets of other sign languages may also be reduced (Section 8.9).

5.2.1 Analysis of the Literature Malta Archive Puddle (LMAP)

Although it was not feasible to investigate the possibility of reducing other sign language glyph-sets, this could be done for LSM. The LMAP was analysed to find low and high frequency glyphs that were used alternatively in LSM spellings. The analysis was carried out with the help of the symbol frequency tool. Additionally the researcher searched for minimally distinctive spellings used for the writing of LSM.

Although there are five categories used in spellings of signs (head-face, handshape, movement, dynamics and body glyphs), minimal contrasts for glyphs were found for handshape and movement categories (see Section 2.7).

When two glyphs, for instance two different handshapes, are used alternatively for the same spelling, there is a strong indication that the two glyphs are variations of the same grapheme (see Section 2.3). In the LMAP, when two or more glyphs were used alternatively for the spelling of the same sign it meant that they were equally acceptable to the writer. Since the main writer was the researcher, it was decided to formulate questions to investigate whether Deaf readers found these glyphs equally acceptable or whether they had a preference for certain glyphs with certain spellings and if so why. This led to another method used in this work, the reading-questionnaire (Section 5.5).

5.2.2 The LSM texts of the LMAP

All texts in the LMAP were included in the analysis of the LSM glyph set. The LMAP (Section 8.2) contains 557 entries. Each entry consists of usually one or more utterance. The majority of the texts, 514 entries, have been written by the researcher. There are 43 entries created by two Deaf research assistants.

5.3 A LINGUISTIC STUDY OF LSM

In order to answer the research questions regarding the written form of pronominals, agreement verbs and other verbs (Section 4.11.2), the actual linguistic study of LSM was carried out. A linguistic study of pronominals of LSM was

necessary since they have never been studied before. The first step was identifying the pronouns of LSM. The researcher analysed how LSM pronouns were used and how they could be represented using SW. Here an attempt was made to use the SW glyphs beyond their phonetic representation. A combination of SW glyphs were chosen to represent the abstract grammatical points in space. The challenge was to find a way of transferring 3D signing to 2D paper. Further details can be found in Section 10.5.

Once the key to pronominal 'affixes' in LSM was established, agreement verbs that move towards or away from these pronominal points were studied. The researcher studied agreement verbs in LSM for the first time and categorized them into three main types: anchor-initial, anchor-final and free agreement verbs (Sections 10.6-10.11). It was necessary to base the decision as to how to represent these verbs in writing on a linguistic analysis of these verbs in LSM.

The 'key' (Section 10.5) was also used in the writing of dual and triple pronouns in LSM which were analysed for the first time (Section 10.12).

The key to writing LSM pronouns and agreement verbs was then tested with Deaf readers by means of the reading-questionnaire (Section 5.5). All Deaf readers were able to read the abstract pronominal points (and made suggestions for improving the 'key') (Section 10.5.4 and 10.7.3). This means that the analysis of a 3-person pronominal system marked in space is acceptable to the Deaf participants.

Once agreement verbs were described for LSM and a key established for their representation in written form, the researcher described other verb classes for LSM

for the first time. From an analysis of the LSM texts and LSM, LSM signs were categorized as Plain (including Handle classifier verbs) Verbs, Whole Entity Classifier Verbs and Agreement Verbs.

The questionnaire (Section 5.5) served to find out if the pronominal 'key' and its use in the LSM spellings of pronouns and agreement verbs could be read by the Deaf readers and whether they had any views about these spellings.

5.4 AN ANALYSIS OF THE LSM TEXTS

In order to answer the research questions regarding how LSM is represented using SW (Section 4.11.2, iii., iv.), a linguistic analysis of the LSM texts was carried out. Patterns related to the writing of LSM were identified by means of the analysis of the texts.

SW LSM pointing signs are analysed in Sections 6.5 and 6.6. Agreement verbs related to pronominals are analysed in Section 7.7. The analysis of Whole Entity classifier verbs can be found in Section 7.6 and Plain and Handle classifier verbs can be found in Section 7.5. Head-tilt patterns in the LSM texts to mark prosody were analysed in Section 6.8, simultaneous signs or buoys in Section 6.4 and vertical columns in Section 6.7. In Chapter 9 and 10 a full account of the findings and related discussions may be found.

Other findings from the analysis concern LSM plurality (Section 6.3), direct discourse (Section 6.10) and fingerspelling names (Section 6.11). These were not investigated further in this work.

All LSM SW signs analysed and taken from the LSM texts were given a number for coding purposes (see Chapters 6 and 7).

The analysis of the written form of LSM contributes to the understanding of the linguistics of LSM and offers a contribution to the field of general sign linguistics.

5.4.1 Which LSM texts were analysed?

The texts analysed were taken from the LMAP (Section 8.2). The full list of texts is as follows:

1) Children's stories: Barnuża Ħamra (Little Red Riding Hood), Il-Fellus L-Ikraħ (The Ugly Duckling), Ġakki u s-Siġra tal-Fażola (Jack and the Beanstalk), Nokklasafra (Goldilocks), Passiġġata (A Stroll), Peter Pan (Peter Pan), Iż-Żarbun li Jtir (The Flying Shoe).

2) A list of prayers: Il-Kredu (The Creed), Il-Manifikat, (The Manificat), Mass 03 consists of some prayers of the Catholic Mass and is-Salve Reġina (Hail Holy Queen).

3) Bible translations: 'Luqa1v' to 'Luqa 21v' consist of all the translated excerpts of the Gospel of Luke that were analysed. All entries listed as 'Mattew' are excerpts that have been translated from the Gospels of Matthew into LSM. All these entries were analysed.

5.4.2 How to access the data?

The way to access these works is explained prior to the chapters presenting the analysis of these texts (Chapters 6 and 7) and is thus found in Section 6.2.

5.5 THE READING-QUESTIONNAIRE

The reading-questionnaire was formulated to discover the preferences of the Deaf readers. It was also created to find out whether the LSM written forms could be read and to receive the views of Deaf readers. The reading-questionnaire does not only consist of question-answer tasks. Rather the questions are created in order to observe what happened, discuss and record the views of the Deaf readers as faithfully as possible.

The reading-questionnaire was used primarily to collect qualitative data regarding views and readability of the texts. However some statistical information regarding preferences was also obtained and has been processed and presented in table forms and included in the work in the relevant sections.

The researcher video recorded all sessions of the Deaf readers responding to the reading-questionnaire. She was also present, sitting next to the Deaf readers during the responses in order to clarify where necessary and receive feedback.

Although the questions are asked primarily to gather qualitative data, they are also similar to acceptability judgement tests, where two or more minimally different linguistic representations are presented to native signers for their response (Chomsky, 1965; Schütze, 1996). There is an ongoing debate on the reliability of this method (cf. Culicover & Jackendoff, 2010; Edelman & Christiansen, 2003; Gibson & Fedorenko, 2010; 2013; Phillips & Lasnik, 2003; Sprouse and Almeida 2010; 2012; 2013). However, acceptability judgement testing is criticised mainly when large

sampling is an option (Gibson & Fedorenko, 2010, p. 233). In this work large sampling was not possible (see Deaf population, Section 1.4).

5.5.1 Deaf Readers opinions regarding glyphs used in spellings

The first exercise of the reading-questionnaire concerned the preference for glyphs in spellings. In Section 5.2.1 it was explained how two glyphs that are used alternatively strongly suggest that they can be substituted with one another. Since the researcher was the main writer of the texts it was decided to create questions for Deaf readers to understand whether these variable glyphs (as for the writer) were both equally acceptable to the Deaf readers. If not, their reasons for preferring one glyph over another could reveal information about the phonetic-phonological composition of LSM.

The results concerning 'equal acceptability' of glyphs, or otherwise can be found in Chapter 8. The Deaf readers' views related to glyph preferences were described by the researcher and these were incorporated into the relevant sections of this work.

5.5.2 Readers feedback regarding SW of LSM pronominals

After carrying out the linguistic study of LSM pronominals and the 'key' proposed to writing pronominals and eliminating ambiguity (Section 5.), Exercise 7 (Appendix C) was formulated to check for the readability of this 'key' and to receive the views of the Deaf readers concerning this area of SW of LSM. Exercise 7a consisted of a description of the SW of LSM pronominals. This exercise was explained to the Deaf readers, in the way that spellings are explained to readers learning the written language. Once it was explained that the shoulder glyph represents the body and the

tense glyph the pronominal points (Section 10.5), the Deaf readers were asked to read LSM agreement verbs. Their reading was observed and whenever the reader hesitated or appeared to be having difficulty they were questioned and any preferences or other views concerning the spellings of LSM pronominals were recorded by the researcher and included in this work in different sections of Chapter 10.

5.5.3 Readers' feedback regarding SW of LSM WE classifier verbs

The main question regarding WE classifiers concerned the sideway vs. the forward positioning of the SW classifier glyphs in the LSM texts. Exercise 8 was formulated to observe the reading of LSM WE classifier verbs and receive any feedback that concerns these verbs and their writing. Once again the views expressed by the readers were recorded and are included in this work (Section 9.10.2)

5.5.4 UREC Approval

Since one of the methods applied to the work involves Deaf participants, in the early stages of the work the researcher applied for full approval from University Research Ethics Committee (UREC) regarding ethics in the methodology applied in this dissertation and full approval was obtained before the data was collected.

5.5.5 Participants

Ten Deaf participants participated as readers of the reading-questionnaire. Since readers of SW were required as participants, the sample was not taken randomly, but rather the ten known SignWriters (see Section 1.4.2) were all asked to participate in the study. A letter was sent to all the participants who gave their

written consent to participate in this work. The letter was translated into LSM by the researcher.

All participants had formal instruction in SW (Section 1.4.2). Two of them have been using SW since 2001, while the others since 2003. All participants are native signers of LSM.

Although ten is a small number, it is a large sample of the Maltese Deaf population (see Section 1.4). Each participant is assigned a number from 1-10 in order to remain anonymous.

There are a few differences between them. Participant 1 is a Deaf child of Deaf parents and has acquired LSM through his/her parents and can use the older and younger variety of LSM (Section 1.3.3). The others are all Deaf adults born into hearing families. All these individuals claim to use the spoken language at home. All participants except one can use both the younger and older varieties of LSM, one of the participants is a user of mainly the older variety of LSM (see Chapter 1, Section 1.3.3). Due to the size of the Deaf Community in Malta, no further details can be revealed for the sake of anonymity.

5.5.6 Precautions taken

Prior to collecting the data from the reading-questionnaire the following precautions were taken: 1) The reading-questionnaire was piloted (Section 5.4.3); 2) the questions were translated to the participants in LSM; 3) the sessions were video recorded, 4) the researcher was present during recordings to clarify where necessary, and 5) attention was paid to provide regular breaks where necessary.

Additionally each participant had a separate reading-questionnaire form to fill in. It was also emphasized that there were no right and wrong answers and that it was their personal opinions that was of interest to this work.

The researcher would often write notes during the responses to the reading-questionnaires noting other comments that the participants would share with the researcher. These are included in the work and are found in different sections of this work, where appropriate.

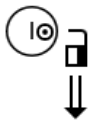
5.5.6.1 Piloting the Questionnaire

Prior to carrying out the reading-questionnaire that was used in this work, the questionnaire was piloted with one participant. The pilot was carried out in order to check that the sequencing of questions and the wording of the questions were appropriate and to identify any misleading questions.

The pilot questionnaire[35] can be found in Appendix D. It was decided to not include the whole pilot questionnaire there, since it is identical to the one used in this work Appendix C, except for Exercise 1. In Appendix D the pilot Exercise 1 can be found.

The pilot showed that Exercise 1 was problematic since spellings were not minimally distinctive. Since the positioning of glyphs with one another is flexible in SW (see Chapter 2, Section 2.6), spellings may vary in their positioning of glyphs e.g. O𝍘T

[35] A more extensive pilot study was not feasible because it would mean reducing the Deaf participants in the actual study. The LSM Deaf community is very small and finding ten participants willing to participate as quite challenging.

(SISTER)  vs.  . The two spellings of O⊣T (SISTER) vary not only in the choice of handshape glyph  and  , but also in the placement of SW glyphs. In the pilot it was noticed how the participant may have chosen a preferred spelling on the basis of the placement of glyphs rather than the difference in glyphs. It was decided to modify Exercise 1 of the reading-questionnaire for the work by eliminating the glyph-positioning variance between spellings so that the participants could focus on the minimal difference in glyph form.

After the pilot questionnaire (Appendix D) was carried out it was decided to add more alternate glyphs particularly movement glyphs, in order to question the equal acceptability of variant arrow glyphs used alternatively in LSM spellings.

5.6 AN ANALYSIS OF HOW TO MODIFY AMBIGUOUS LSM SPELLINGS

Another method used in this work consisted of analysing the ambiguous spellings and coming up with alternate spellings that would be clear and unambiguous. Part of this analysis overlaps with the linguistic analysis of LSM (Section5.3). The analysis of how to modify spellings however consisted of finding concrete ways of representing these abstract linguistic findings of LSM using SW. Arriving at the SW 'key' involved not just a study of the LSM grammatical use of space (Section 4.9.1) but furthermore of a way of representing this using 2D space and SW (Section 10.5).

5.7 GATHERING THE FINDINGS

Finally the last method involved in this work concerns a synthesis of the findings concerning the writing of LSM and presenting the orthography of LSM, based on this work that can be put to immediate use by learners of SW LSM. This synthesis is presented as a manual for the writing of LSM and is found in Appendix G.

5.8 LIMITATIONS

There are three main limitations identified in the methodology of this work: 1) The work could not be based on a full description of LSM grammar since this is unavailable. Thus the analysis focussed on what appeared to be most relevant, i.e. the pronominal system in LSM and LSM verbs. 2) There is limited data concerning the use of SW by other sign languages, so comparisons are limited. 3) There are few writers who have written the LSM texts in the LMAP (Section 5.2.2). The reading-questionnaire (Section 5.5) is intended to compensate for the lack of a pool of writers.

5.9 CONCLUSION

This chapter described the methods used to investigate the research questions of this work. All methods are primarily qualitative, although some statistical information from one of the methods, the reading-questionnaire, has been obtained. The methods consist of a linguistic study of LSM (Section 5.3), the study of how SW has been applied to LSM (Section 5.2 and 5.4), Deaf readers views (Section 5.5), modifying ambiguous spellings (Section 5.6) and synthesising the findings in

order to come up with a description of the LSM orthography that can be put to immediate use (Section 5.7).

CHAPTER 6: ANALYSIS OF THE LSM TEXTS: PLURALITY, PRONOUNS & POINTING SIGNS

6.1 INTRODUCTION

In this chapter and in Chapter 7 the analysis of the LSM text is carried out. The main topics analysed here are: Plurality (Section 6.3), Buoys (Section 6.4), Pointing signs and pronouns (Sections 6.5 and 6.6), Vertical Columns (Section 6.7) Head-Tilt patterns (Section 6.8). Verbs found in the LSM texts are analysed in Chapter 7.

6.2 SEARCHING FOR THE DATA IN PUDDLE

The analysis of the LSM written texts is presented here. The source of all the texts is the LMAP (Section 5.2.2 and 8.3). The LMAP is accessed either from the homepage http://www.signbank.org/signpuddle/ and opening the link to the Malta Puddle. Otherwise the exact link to the search area for the data is http://www.signbank.org/signpuddle2.0/searchword.php?ui=1&sgn=147 . Here the data can be searched for by the name of the text (Terms and Titles, any part of word). For every example in Sections 6.3-7.10 the name of the text is listed below the SW in brackets, e.g. (Barnuza 20)[36].

[36] SignPuddle 2.0 is case-sensitive so when searching by the name of the text the case needs to be written as is shown in brackets under the SW e.g. (Barnuza Hamra 20). When a comma separates more than one number, this means that the SW can be found in more than one utterance, e.g. Barunza Hamra 20, 23 one would have to search for Barnuza Hamra 20 and Barnuza Hamra 23 separately.
SignPuddle 3.0 is case-insensitive (Slevinski, personal communication January 30, 2014) so when searching for the data using SignPuddle 3.0 this note may be disregarded.

Every sentence of a whole text can be sorted together when its name is entered in the 'Terms and Titles' of the 'Search by word' of the LMAP. Although the full names for the texts can be entered to find the data, for ease a shorter name can be inserted. These are the shortened names of the texts analysed: Barnuza, Fellus, Gakki, Kredu, Luqa1v, Luqa2v, Luqa3v, Luqa10v, Luqa15v, Luqa21v, Manif, Mass 03, Mattew, Nokk, Pass, Peter, Salve, Zarbun.

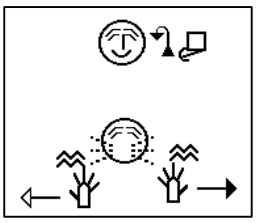
The list of texts include children's stories. These are Barnuza (Little Red Riding Hood), Fellus (The Ugly Duckling), Gakki (Jack and the Beanstalk), Nokk (Goldilocks), Pass (Passiġata/ A Stroll), Peter (Peter Pan), Zarbun (Iz-Zarbun li Jtir/ The Flying Shoe). Some of the LSM texts found in the LMAP consist of traditional prayers. The short names of the prayers analysed are Kredu, (The Creed), Manif, (The Manificat), Mass 03 are a few prayers of the Catholic Mass and Salve (Hail Holy Queen). Luqa1v –Luqa 21v and Mattew are all excerpts that have been translated from the Gospels of Luke and Matthew into written LSM.

All the data was written between 2008 and 2010. The latest works are the prayers and Mass rites.

6.3 PLURALITY

In this section data concerning LSM written forms of plurality is analysed from the texts. This section talks mainly of plurality of LSM nouns. In Section 7.2 it is discussed how the distinction between verbs and other word classes is not always clear-cut.

In (1) the first sign FJURA (FLOWER) is anchored to the body. Reduplicated movement for this LSM sign is not used to express plurality. Rather the lexical sign ĦAFNA (MANY) is used to express plurality.

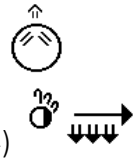
(1)  FJURA (FLOWER) ĦAFNA (MANY) (Barnuza 20, 23)

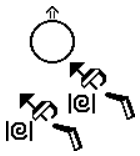
In (2) the singular form ŻARBUN (SHOE) is written. In (3) the classifier plural is written, where a classifier B-handshape is written with the 'down-down+forward' glyph. Using classifiers to express plurality in LSM has been described in the LSM dictionary (Azzopardi-Alexander, 2003; 2004) for a large number of LSM signs (see Section 4.10.1). In (3) the repeated plurality glyph consists of 'down-down+forward arrows' is used. Another example where the classifier is used to express plurality can be seen in the SW LSM sign BAJD (EGGS) (20).

(2)  ŻARBUN (SHOE) (Zarbun 01)

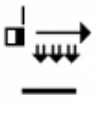
(3)  CL-ŻRABEN F'RINGIELA (SHOES IN A ROW) (Zarbun 01)

The SW sign ŻARBUN (SHOE) in (5) is reduplicated to express plurality. The reduplicated movement is represented in SW by means of the repeated glyphs that together spell the sign ŻARBUN (SHOE)  .

(4)  CL-OĠĠETT-TOND (CL-ROUND OBJECT) (Gakki 4)

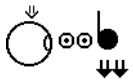
(5)  ŻARBUN-ŻARBUN (SHOE-SHOE) (Zarbun 01)

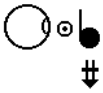
In (7) the sign AĦWA (SIBLINGS) is not inflected for plurality, however the SW sign prior to this (6) INTOM (YOU plu.) is a plural 3rd person pronoun and thus this indicates that the following SW sign is plural (in the same way that the 'these' in 'these sheep' signifies plurality). Once again the plural glyph in INTOM (YOU PLURAL) uses a combination of the glyphs 'down-down' and 'forward' and is very similar to the glyph combination of arrows used in (3).

(6)  INTOM (YOU-PLU) (Mass 03 09)

(7)  AĦWA (SIBLINGS) (Mass 03 09) and  (Peter 01)

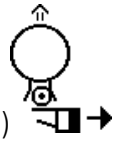
In (8) the reduplicated double-movement glyph expresses plurality. The double contact glyph implies movement and thus the double movement arrow glyph is redundant, and the choice to leave it out can be made. The singular form MARA (WOMAN) can be found recurrently in the LSM texts, with (9a) and without (9b) the movement arrow glyph.

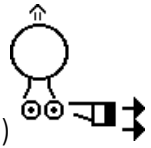
(8)  NISA (WOMEN) (Luqa1v42)

(9a)  MARA (WOMAN) (Luqa1v5) and (9b)  (Gakki 8)

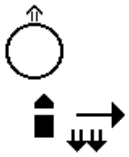
In (10) the sign BAQRA (COW) was read as BAQAR (COWS). This indicates that for the writing for the singular form, one contact movement glyph may be a clearer marker of singularity. (12) also uses double contact glyphs to mark plurality, while (11) uses a single 'brush contact' glyph. Double contact glyphs may be used to signal plurality in LSM, while single contact glyphs signal singularity. As argued for (8) and (9) the arrow glyphs in (11) and (12) may be redundant, since the contact glyphs implies movement.

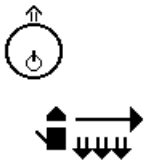
(10)  BAQRA (COW) (Gakki 2)

(11)  QASSIS (Luqa1v8)

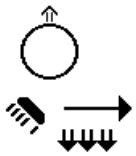
(12)  QASSISIN (PRIESTS) (Mattew2v4)

Numbers (13) and (14) are both plural forms. Once again the plural glyph form  is used for the representation of LSM plurality in (14). Unlike the examples of plurality glyphs shown so far, in (13) only two small downward arrows are used. Also in (14) the glyph that shows the tongue sticking out is added to the head glyph. This helps distinguish between the very similar spellings of (13) NIES (PEOPLE) and (14) TFAL (CHILDREN).

(13)  NIES (PEOPLE) (Luqa2v1; Peter 29)

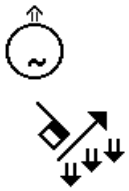
(14)  TFAL (CHILDREN) (Peter 10; Peter 32).

Examples (15) and (17) also use the 'down-down+forward' movement glyph to represent the plurality in LSM spellings. Number (17) has been written diagonally to help distinguish between this and the sign INTOM (YOU PLU.), (6). The hand is held diagonally while signing the LSM sign JIEM (DAYS).



(15) POST-POST-POST (PLACE-PLACE-PLACE)

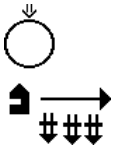
(16) POST (PLACE) singular (Luqa2v8)

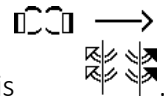


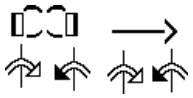
(17) JIEM (DAYS) (Luqa2v21)

In (18) the movement involved in the LSM sign BELT (TOWN) is a down-forward movement. Thus for the writing of the plural form the same down-forward movement glyph was used  though following the pattern of the plurality glyph  . It is suggested here that either this spelling is an exception to the rule, in the same way that English plural forms are sometimes marked by '-s' and other times '-es'. Otherwise the plurality glyph identified from the LSM texts  could be adopted for the spelling of this sign, while also using the down-forward arrow glyph of (18) resulting in the SW sign  for LSM BLIET(TOWNS).

(18) BELT (TOWN) (Mattew2v6; Mattew 2v23)

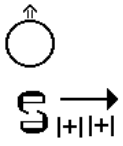
(19)  BLIET (TOWNS) (Mattew2v6)

Another two example where the plural form of an LSM sign does not use the frequent  plurality glyph identified in the LSM texts can be seen in (20) and (21). (20) is not just a reduplicated sign of BAJD (EGG) (21), but during the second syllable it moves to the side. This is similar to the sideway movement involved in other plural forms discussed (e.g. 15, 17, 19). It is proposed here that the same pattern of the plurality glyph is retained but that it is modified in the same way as it was for (19). Where the plurality glyph can still be read with ease. On the basis of this the re-spelling suggested for (20) is  .

(20)  BAJD (EGGS) (Fellus 02)

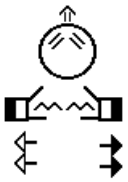
(21)  BAJDA (EGG) (Fellus 04)

In (22) the singular SW form (23) is marked for plurality by the repeated clasp glyphs. This glyph resembles the plurality glyph  and follows the same pattern discussed also for examples (19) and (20).

(22)  ⧧BIEB (FRIENDS) (Peter 07)

(23)  ĦABIB (FRIEND) (Peter 04).

In (24) there is a reduplicated movement, seen also in (5) and (8). However here the SW sign is not a plural noun but is a singular form (in the same way that the English word 'news', 'lens', 'phonetics' are singular nouns that end in 's'[37])

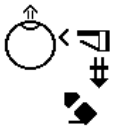
(24)  KEWKBA (STAR) (Mattew2v2)

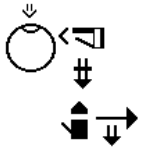
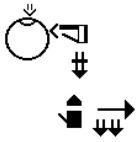
(25a) and (25b) show two SW singular forms of the LSM signs TIFEL (BOY). In (25b) the end handshape is written. (26a) and (26b) show two different spellings for the plural of (25b). In (27) the dual form was written using SW. Here the double head nod glyph was written in order to differentiate between the plural form and dual form. Additionally the downward arrow glyphs are placed further away from each other  , unlike the plurality glyph where they are close together  .

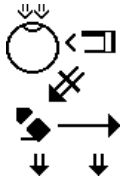
The use of head-nods glyph and downward arrows that are spread out can be found in another example (28) involving spatial comparisons. Although there are three head-nods in (28) and two in (27) the markers share a similar function. Using these

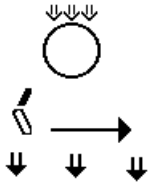
[37] Examples courtesy of http://virtuallinguist.typepad.com/the_virtual_linguist/2009/10/singular-nouns-ending-in-s.html weblog retrieved February, 1, 2014

glyph markers makes it possible to write spatial comparisons in SW without the need to write vertically (see Section 9.4).

(25a)  TIFEL (BOY) (Gakki 1) and (25b)  TIFEL (BOY) (Peter 02)

(26a)  SUBIEN (BOYS) (Peter 01) and (26b)  (Peter 07)

(27)  ŻEWĠ-SUBIEN (TWO-BOYS) (Luqa10v11)

(28)  PLATT-PLATT-PLATT (PLATE-PLATE-PLATE) (Nokk 02; Nokk 07).

6.4 BUOYS IN THE LSM TEXTS

A 'buoy' is a term coined by Liddell (2003b) to refer to the non-dominant hand that is held across a number of following signs. Buoys seems to be related to Handle classifier verbs (see Section 7.5.3), since the many buoys found in the texts involve the hand of a previous handle classifier verb that is kept stationary during following signs that are produced.

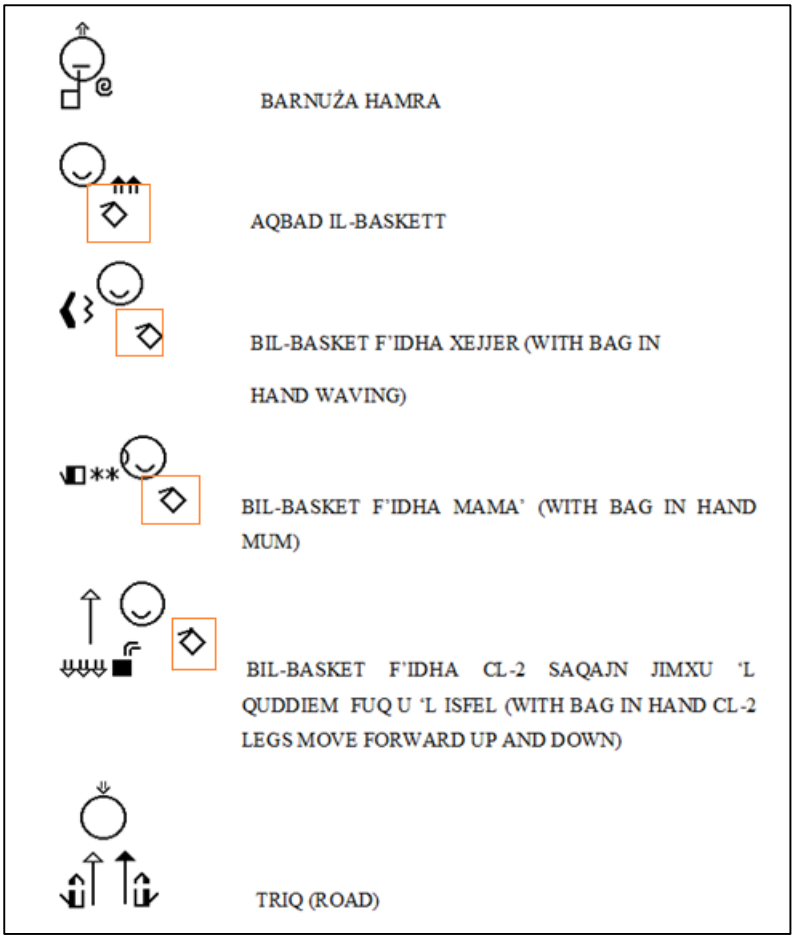
6.4.1 Dominant right hand buoy

In the LSM texts it can be seen that often it is the dominant hand that is kept stationary and the left non-dominant hand that moves. Examples (29) to (34) illustrate this. The marked glyph shows the stationary buoy.

In Section 9.9 a discussion whether these buoys need to be represented in written form s presented. A reason for including the analysis of these is due to a direct comment from one of the readers of the texts, stating that the buoy needs to be removed for reading purposes.

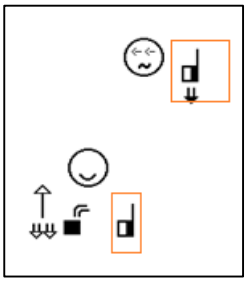
Another participant commented that text that included buoys was more complex and thus more advanced than texts that did not include the buoys in writing, and thus suggested including the buoys according to the level of the written text. Basic levels and children's stories need not include buoys, while more advanced texts such as biblical translations could include them. The fact that the buoys are not needed in writing points to their function in the sentence. Are they truly necessary as a significant linguistic element, or is it just the hand that stays in position physically rather than returning to neutral position?

The issue regarding the inclusion or exclusion of these elements from the SW sign may offer a better understanding of word-boundaries in SW. A higher percentage of the Deaf participants preferred them not to be written, does this indicate that the buoys are not a part of the LSM sign? More discussion concerning this topic can be found in Section 9.9.

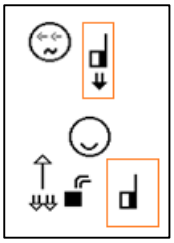
(29) 

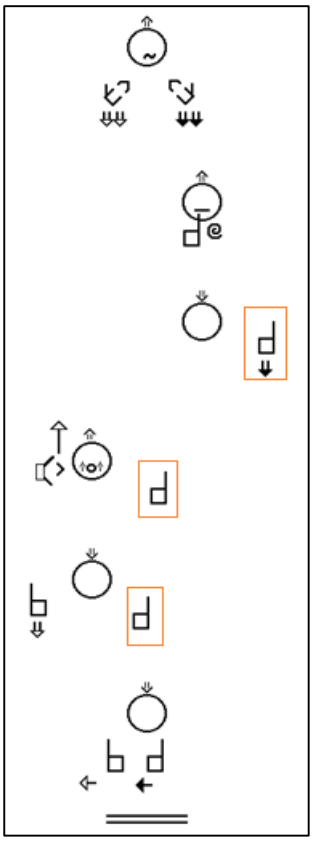
[38]

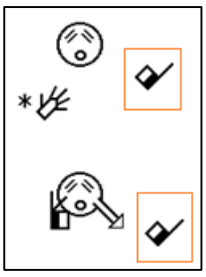
(Barnuza Hamra 12) In this example the dominant right hand that was used in the spelling BASKET (BAG) is used in the spellings of the following signs.

(30)  Barnuza Hamra 13b (Right hand hold)

[38] In these examples the buoy is marked by the encasement marked in orange.

(31)  (Barnuza Hamra 21)

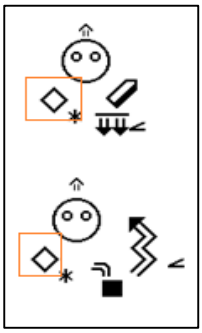
(32)  (Barnuza Hamra 25)

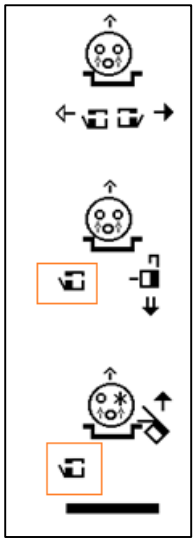
(33)  (Nokk 17) Index Hand pointing remains in place.

(34)  DAR (Right Buoy) + KELB +CL-RIĠLEJN FUQ DAR (HOUSE-Right Buoy + DOG+CL-2LEGS ON HOUSE) (Zarbun 12)

6.4.2 Non-dominant left hand buoy

In examples (35) to (43) the left handshape glyph remains in the spellings of LSM signs.

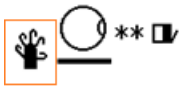
(35)  BASKET (Left Hold) TELAQ U TELA' GĦOLJA (BAG (left hold) LEAVE, GO UP HILL) (Luqa 1v39)

(36)  FETAĦ ARMONJU (Left Hold)+‘Ġ’ RA (OPEN CUPBOARD-left hold+‘Ġ’-SEE) (Gakki 10)

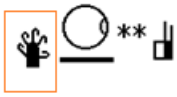
(37)  ŻOMM (Left Hold) +ĦARAB (HOLD-left hold+ RUN AWAY) (Gakki 21)

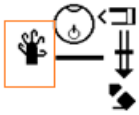
(38)  ŻOMM (Left Hold) +DAĦAL (Luqa15v6)

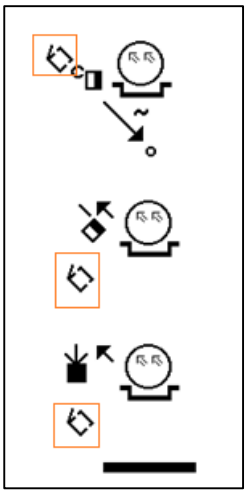
(39), (40) and (41) are different from the other buoys because the non-dominant hand that is held is part of a lexical sign, ORS (BEAR). The other examples of this section are all examples of HANDLE classifier handshapes that remain in place.

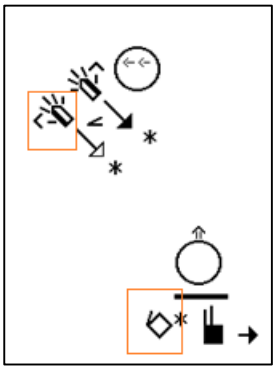


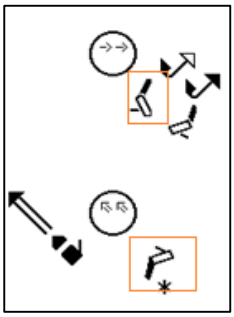
(39) MAMA-ORS (MUMMY-BEAR) (Nokk 01)

(40)  PAPA-ORS (DADDY-BEAR) (Nokk 01)

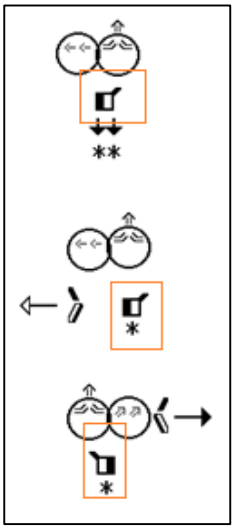
(41)  TIFEL-ORS (BOY-BEAR) (Nokk 01)

(42)  SPARA (Left-Hold) + HEMM+'W' (SHOOT-Left Hold+ THERE+'W')(Peter 07)

(43)  ĦATAF (Left Hold)+ U. (GRAB-Left Hold+AND) (Peter 11)

(44)  ĠABAR (Left Hold) + TAR (PICK UP-Left hold + FLY)(Peter 18)

In the last example (45) of a buoy found in the LSM text, the buoy involved switches from the right dominant hand to a left non-dominant hand. Here the right handshape of the first SW sign DNUB-TIEGĦI is held during the sign WARRAB (PUSH AWAY) in the following two SW signs. In the last SW sign WARRAB (PUSH AWAY) is read as right hand moving (because of the dark shaded arrow glyph, see Chapter 2). This means that the right handshape that is held during the second SW sign, switches to the left hand during the last sign.

(45)  (Luqa15v18)

6.5 POINTING SIGNS

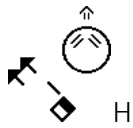
SW pointing signs in the LSM texts were the first to be identified as not clear enough to be read. Due to the ambiguity caused by pointing signs, the readers were unable to identify the meanings of several spellings that included an index handshape glyph and a movement glyph. Instead of reading INTI (YOU), the readers would read HEMM (THERE) or a different person pronoun, instead of ILLUM (TODAY) they would read JIEN (ME) etc. This confusion caused problems with reading the LSM texts.

LSM pronouns are a very important part of the LSM noun-phrase. If the pronouns cannot be read, the whole noun-phrase cannot be read. In a LSM sentence like: INTI MAR BAĦAR (YOU GO SEA), since the SW pronoun INTI is not standard it can be read with any other pronoun that involves the index handshape glyph, as HU MAR BAĦAR (HE GO SEA) or as another pointing sign such as, HEMM MAR BAĦAR (THERE GO SEA). This evidently causes a major difficulty for reading.

The development of clear and regular SW LSM pronouns and other pointing is a basic yet fundamental step in the evolution of the LSM orthography. The analysis of irregular pointing signs can be found in Section 6.5 and 6.6. From this data it was questioned how different pronouns could be distinguished in written form. This would then pave the way for other SW distinctions related to the pronouns, mainly the writing of SW agreement verbs (Section 10.6).

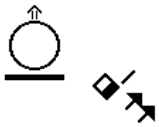
6.5.1 Straight movement and pointing

The writing of pointing signs has often employed the straight movement glyph↗. Straight movement glyphs are less common than other movement glyphs. As can be seen in examples (46) to (49), different pointing signs have employed the straight movement glyph. All signs presented here are for the sign HEMM (THERE) however readers often read these as third person pronominal pointing. It was observed that the SW sign (49) that used the mouth-pattern of pursed lips  was read as HEMM (THERE) more easily than the others. It may be suggested here that this glyph is used to disambiguate and thus used solely for the sign HEMM (THERE).



(46) HEMM (THERE) (Luqa21v27)

(47) HEMM (THERE) (Luqa2v11)



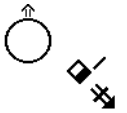
(48) HEMM (THERE) (Luqa2v5)

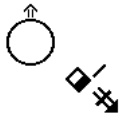
In (49) the spoken mouth-pattern glyph ‘m’ was used in an attempt to disambiguate HEMM (THERE) from other LSM pointing spellings.

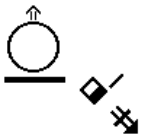
(49) HEMM (THERE) (Luqa1v39)

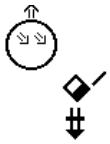
6.5.2 Down Forward glyph with Index glyph

Another arrow glyph used for the spellings of pointing signs is the down-forward glyph . This arrow glyph has been used in spellings for HEMM (THERE) that has also used the straight movement glyph. Furthermore it can be seen that the index handshape has been rotated to the following positions (50-52), (54), and (55-57). The arrow glyphs have rotated to point to the right, left and centre lanes of the vertical column (Section 6.7). Once again the sign HEMM (THERE) was read more easily with the mouth-glyph that represents pursed lips similar to the ‘m’ sound.

(50)  HEMM (THERE) (Mattew2v1)

(51)  HEMM (THERE) (Luqa2v12)

(52)  HEMM (THERE) (Luqa2v8)

(53)  DAK (THAT ONE) (Gakki 3)

(54)  HEMM (THERE) (Luqa1v5)

(55)  HEMM (THERE) (Luqa1v5)

(56)  HEMM (THERE) (Luqa1v5)

(57)  HEMM (THERE) (Luqa2v17)

6.5.3 Down movement glyph

Another movement glyph used for pointing signs is the down glyph  . In (58) (59) and (60) it can be seen that there are double down glyphs used for the signs ILLUM/ISSA (TODAY/NOW). However this double arrow glyph was not enough to disambiguate this LSM sign from other index pointing signs.

(58) ILLUM/ISSA (TODAY/NOW) (Luqa2v11)

(59) ISSA (NOW) (Luqa2v29) In this writing a slightly different index handshape glyph was used in an attempt to disambiguate.

(60) ILLUM/ISSA (TODAY/NOW) (Luqa1v20)

(61) DAN (THIS) (Luqa12v23-24)

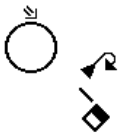
(62) ISSA/ILLUM (NOW/TODAY) (Luqa1v7)

(63) WERA B'SUBAJGĦ FUQ XELLUG (POINT TO UP RIGHT) (Peter 09)

(64) WERA ĠEWWA CL-DGĦAJSA (POINT INSIDE CL-BOAT) (Peter 14)

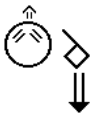
(65) HEMM-ISFEL (DOWN-THERE) (Peter 15)

In examples (66), (67) and (68) slightly different arrow glyphs were used in an attempt to differentiate these spellings from the more common use of pointing signs HEMM (THERE), DAN/DAK (THIS, THAT). The spelling of REĠA (AGAIN) in (66) uses a forward and over glyph. The spellings in (67) and (68) for ĠURNATA (DAY) and ISFEL (SOUTH) use a longer downward arrow than (58-65).



(66) REĠA (AGAIN) (Mattew2v20)

In (67) the handshape glyph is placed at the head glyph in an attempt to distinguish from other pointing signs.



(67) ĠURNATA (DAY) (Barnuza Hamra 3)

(68) ISFEL (SOUTH) (Mattew2v1) Here a mouth-pattern was included to differentiate between other pointing signs.

6.6 PRONOUNS

Pronouns are part of pointing signs but are presented here as a separate section. The lack of standard spellings for each pronoun is evident from the data shown here.

6.6.1 1st Person Singular

For all the signs JIENA the contact glyph has been used. This explains why this glyph was first recommended for the writing of 1st person singular (see Section 10.4). However this glyph was not recommended for usedby the participants in this work (Section 10.5.4).

The spellings listed, from the LMAP, for JIENA (ME/I) are quite similar to each other. One spelling of this sign (76) show that beginning of the use of the shoulder glyph. The index hand for all spellings is rotated to this position . The spellings in (69), (74), (75) and (76) use the handshape glyph is parallel to the floor , while in (70), (71), (72) and (73) the handshape glyph is parallel to the wall (see Chapter 2).

(69) * JIENA (I) 1ST PERSON PRONOUN (Luqa1v38)

(70) JIENA (I) 1ST PERSON PRONOUN (Barnuza 17)

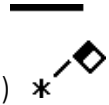
(71) JIENA (I) 1ST PERSON PRONOUN (Gakki 6)

(72) JIENA (I) 1ST PERSON PRONOUN (Nokk 07)

(73) JIENA (I) 1ST PERSON PRONOUN (Peter 17)

(74) JIENA (I) 1ST PERSON PRONOUN (Peter 30)

(75) JIENA (I) (Luqa15v21b)



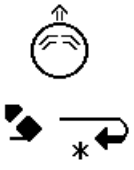
(76) JIENA (I) (Mass 03 03; 04; 08)

6.6.2 1st Person Plural

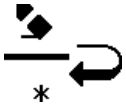
The spellings for 1st person plural use the B-Hand. In (77) the end position of the hand is written. In (78) the open fingers B-Hand is used. In (80) the spelling includes the use of the shoulder glyph (see Section 10.5). The arrow glyphs used for the spelling of this sign are similar with slight variation in the size and length of rotation. In (80) a larger and fuller rotated glyph is used. (80) also makes use of the shoulder glyph (see Section 10.5).

(77) AꟾNA (WE) (Liturgija 02)

(78) AꟾNA (WE) (Mattew2v2)



(79) AꟾNA (WE) (Luqa3v10)



(80) AꟾNA (WE) 1ST PERSON PLURAL (Salve 02)

6.6.3 2nd Person Singular

The index hand glyph used to write LSM second person singular is often rotated to this position  in an attempt to mark the 2nd person singular glyph. In (84) it is rotated to this position  and in (87) it is rotated to  . Arrow glyphs also differ in the spellings. At times the forward-down glyph is used and other times the forward arrow. It is discussed in Section 10.5 that the marking of person points in this manner is insufficient.

(81)  INT (YOU SG.) (Luqa1v43)

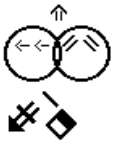
(82)  INT (YOU SG.) (Luqa1v44)

(83)  INT (YOU SG.) (Salve 04)

(84)  INT (YOU SG. (Barnuza 27)

(85)  INT (YOU SG.) (Luqa1v20)

(86) INT (YOU SG.) (Luqa3v11)



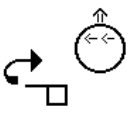
(87) INT (YOU SG.) (Luqa2v35)

(88) INT (YOU SG.) (Luqa1v14)

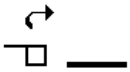
(89) 2 PERSUNA SINGULAR (2ND PERSON SINGULAR) (Barnuza Hamra 7, 8)

6.6.4 2nd Person Plural

Spellings for second person plural from the LMAP are various and not standard. In (90) and (91) the index handshape is rotated to point towards the left . In (92) it is rotated forward . Spellings in (91) and (92) use the shoulder glyph. In (90) and (91) the movement is a rotated-sweep while in (92) it is a bounce and straight movement that is used for plurality (Section 10.5.4).



(90) INTOM (YOU-PLU) (Luqa15v22)

(91)  INTOM (YOU-PLU) (Nokk 01)

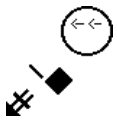
(92) INTOM (YOU-PLU) (Mass 03 09)

6.6.5 3rd Person Singular

The 3rd person singular pronouns is the highest frequently used pronoun in the LMAP. Various spellings for 3rd Spellings for 3rd person singular found in the LMAP are presented here. Five different rotations for the index-handshape glyph used to spell 3rd person singular LSM pronouns can be found in the data:  . Down-forward glyphs and forward glyphs are used interchangeably (Section 6.9).

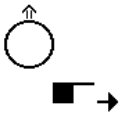
(93) DIN (THIS ONE) (Luqa1v36)

(94) DIN (THIS ONE) (Luqa1v36)

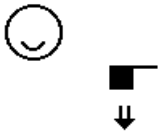


(95) DAN/HU (THAT ONE/HIM) (Peter 35)

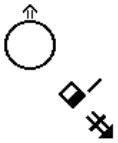
(96) DAN or INT (THIS or YOU SG.) (Gakki 3)

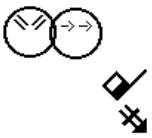
(97)  DAN/HU (THAT ONE or 3rd PERSON SG.) (Luqa10v37)

(98)  3 PERSUNA XELLUG (3rd PERSON LEFT) (Barnuza 5)

(99)  DIN/HI (THAT ONE or 3rd PERSON SG.) (Nokk 20)

(100)  HU/DAN (THAT ONE or 3rd PERSON SG.) (Gakki 8)

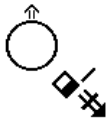
(101)  DIN/HI (THAT ONE or 3rd PERSON SG.) (Peter 01)

(102)  DAN/HU (THAT ONE or 3rd PERSON SG.) (Peter 17)

(103)  HU/DAN (THAT ONE or 3rd PERSON SG.) (Gakki 8)

(104)  HU/DAN (THAT ONE or 3rd PERSON SG.) (Gakki 9)

(104) HU/HI (HE/SHE 3RD PERSON SG.) (Luqa2v23)



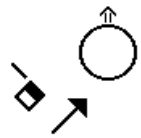
(105) HU/HI (HE/SHE 3RD PERSON SG.) (Peter 14)

(106) 3 PESUNA SINGULAR (3RD PERSON SINGULAR) or DAN (THIS)

All these spellings are highly ambiguous and almost identical to the spellings for other pointing signs (Section 6.5). The spellings could thus read as 3rd person singular or other signs such as DIN,DAN/DIK,DAK (THIS/THAT).

6.6.6 3rd Person Plural

The movement involved in 3rd person plural pronoun spellings is a sweeping straight movement. Feedback from the Deaf indicates that the preferred movement is 'bounce' since this is a closer representation (Section 10.5.4). This glyph also appears to be an adequate SW plurality marker for LSM signs (see Section 6.3). An attempt at marking 3rd person plural with a shoulder glyph can be seen in (109).



(107) HUMA (THEY 3RD PERSON PLURAL) (Luqa2v12)

(108) HUMA (THEY 3RD PERSON PLURAL) (Zarbun 07)

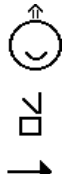
(109) HUMA (THEY 3RD PERSON PLURAL) (Luqa2v9)

6.6.7 Dual/Triple Pronouns

In the LSM texts the following SW signs were used to mark dual and triple pronouns. The use of vertical placement of signs to the left and right lanes (see no. 129) of the vertical column resulted in these spellings. In SW vertical spatial comparisons, often one referent is placed on the right lane, another on the left. When using the dual pronoun (110) and (111) to refer to these two referents the hands are then positioned in the middle lane and the arrows indicate movement towards both the left point and the right point.

(110) HUMA T-TNEJN (THEM TWO) (Luqa1v7)

(111) HUMA T-TNEJN (THEM TWO) (Luqa1v6)



(112) HUMA T-TNEJN (THEM TWO) (Luqa15v7)

The pronoun IT-TLIETA LI AĦNA (THE THREE OF US) was used in the LMAP (113). Here the same movement glyph as was used for the spellings of first person plural (77)-(80) was used while the handshape was modified to the handshape glyph representing number three in LSM.

(113)  IT-TLIETA LI AĦNA (THE THREE OF US) (Nokk 02)

6.6.8 Possessive Pronouns

Possessive pronouns in LSM consist of a closed fist that moves to the pronominal points (Section 10.2.2 for more). The key established in Section 10.5 could also be adopted for the spellings of these signs, since the grammatical space is used here also.

Second person possessive pronouns are usually written with the handshape glyph facing forward as in (114) to (117). However in (118) the handshape is rotated slightly and in (119) the palm faces the side and the movement glyph indicates movement to the left side.

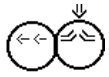
(114)  TIEGĦEK (YOURS) (Liturgija 03)

(115) TIEGĦEK (YOURS) (Luqa1v36)

(116)  TIEGꟸEK (YOURS) (Luqa15v31)

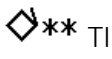
(117)  TIEGꟸEK (YOURS) (Luqa15v21b)

(118)  TIEGꟸEK (YOURS) (Salve 04)

(119)  TIEGꟸEK (YOURS (Luqa15v19)

The spellings of TIEGꟸI (MINE) (120)-(123) follow the pattern of the writing of 1st person singular pronous, where a contact glyph is used to indicate contact with the signer's body. The palm of the handshape glyph faces the signer. This is the opposite orientation of the handshape glyph for 2nd person possessive pronoun.

(120)  TIEGꟸI (MINE) (Nokk 17)

(121)  TIEGꟸI (MINE) (Nokk 16)

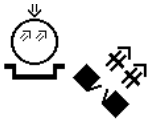
(122)  TIEGꟸI (MINE) (Luqa15v31)

(123)  (Luqa2v29)

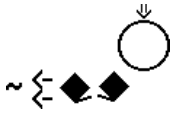
DNUB-TIEGꟸI (124) also uses this pattern with a contact glyph showing contact on the signer's body. It is unclear whether this sign is pronominal or verbal. Subject-pronoun JIENA (I) precedes it. The facial-intensity marker may suggest that it is verbal, because this morpheme is also found attached to WE-Classifier verbs (see example 256 in Section 7.6) and carries the meaning of INTENSITY of movement.

(124) DNUB-TIEGꟸI ꟸAFNA (MY-SIN A LOT) (Mass 03 03)

The spellings for 3rd person possessive (125), (126) and (127) found in the LMAP show movement towards a left and right location. (125) uses the up-forward glyph since the location is not at chest level but at head-level and so the glyph indicates this.



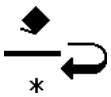
(125) TIEGꟸU/TA' ALLA (HIS/HERS OF GOD) (Luqa2v23)



(126) (Luqa15v27) TIEGꟸEK (YOURS) 3RD PERSON SINGULAR

(127) TIEGꟸU/HA (HIS/HERS) (Luqa1v8)

The spelling of TAGꟸNA (OURS) IN (128) follows the same pattern of spelling of 1st person plural pronouns and 1st person plural pro-triple (113).

(128)  TAGꟻNA (OURS) (Salve 02)

6.6.9 Conclusion to LSM pronoun spellings

From the LSM texts it is evident that there is no regular spellings for pronominal points. Sometimes the spellings for 1st, 2nd and 3rd person attempt to indicate the pronominal points by rotating the handshape to point to the signer's body (1st person), forward to point to 2nd person plural and to the left and right to mark 3rd person. The movement glyphs also are many times written to indicate movement backwards (to the signer, 1st person), forward (second person) and to the left and right (3rd person). These were attempts at regularizing the writing of the pronominal system during the writing of the texts.

At other times the graphical positioning of SW LSM signs in a vertical column influences the direction of the arrow glyphs and the rotations of the handshape glyphs that point towards the pronominal points (see Section 6.7).

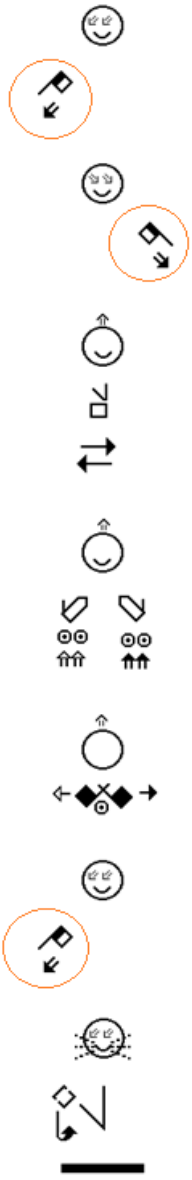
Due to the irregular spellings Chapter 10 argues for a recommended glyph 'key' that would help in the disambiguation of these spellings and thus be helpful for the reading of LSM texts.

6.7 VERTICAL COLUMNS

In this section data that shows the use of vertical columns to position signs to the right, left and centre is shown. The analysis in Section 6.6 (pronouns) shows that at

times the vertical columns would influence the direction of the arrows and the rotation of the handshape glyphs for the spellings of LSM pronouns.

In (129) the marking of referents in the left and right columns can be seen in the marked index-glyphs. In the LSM texts the placement of the sign across the lanes of the vertical columns has been used for spatial comparisons where the sign placed in a lane can be referred to later by movements of glyphs towards this placement.



DAN-XELLUG (THAT-LEFT)

DAK-LEMIN (THAT-RIGHT)

IT-TNEJN LI HUMA (BOTH OF THEM)

FERĦAN (HAPPY)

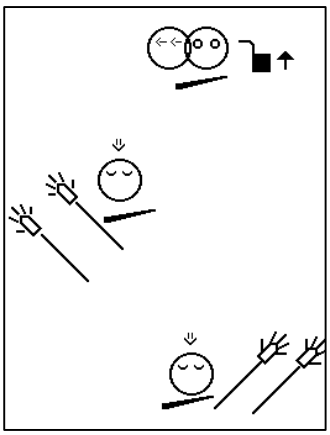
IMMA (BUT)

DAN-XELLUG (THAT-LEFT)

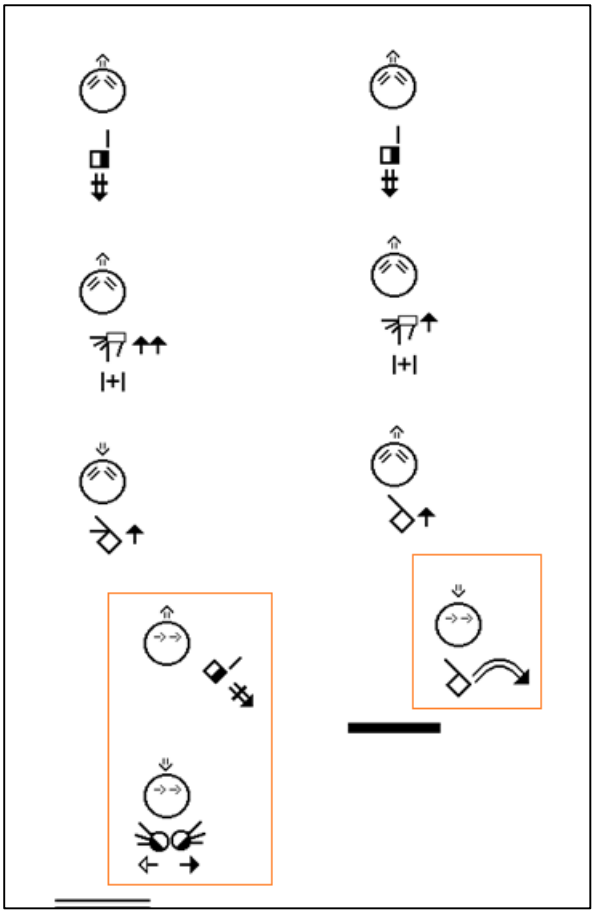
QAWWI (STRONG)

(129) (Luqa15v10)

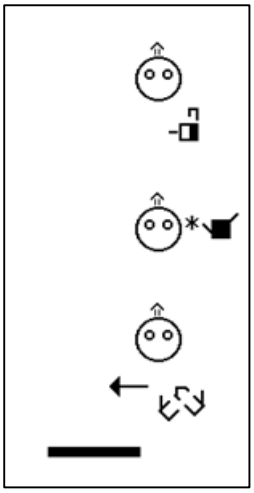
In (130) the vertical column was used to show movement of the arms from the left to the right. This is not a necessity as the ISWA 2010 contains arrow glyphs that represent movement of the arms from the left to the right.

(130)  ‘X’ ŻAMM-XELLUG, ŻAMM-LEMIN (X HOLD-LEFT, HOLD-RIGHT) (Luqa2v28)

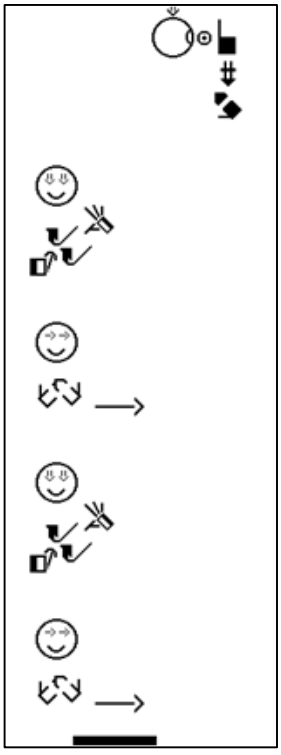
In (131) the last two SW signs HU XEJN (HE NOTHING) are placed to the right column. The last SW sign in the right column is also placed to the left in an attempt to indicate that the index-hand that is a verb moves to the located referent HU (HE). The reading of the reference using SW vertical columns was not always successful and this led to the analysis of how to write the modification of verbs more clearly (see Chapter 10).

(131)  DAN ĦWEJJEĠ TNEJN, IEĦOR XEJN, DAN HWEJJEĠ WIEĦED JAGĦTI LIL IEĦOR (THAT ONE CLOTHES TWO, THE OTHER ONE NOTHING, THAT ONE CLOTHES ONE GIVE TO OTHER ONE) (Luqa3v11)

In (132), (133), (134), (135) the placement of signs to the left and right of the vertical column resulted in the arrow glyphs of signs being directed to the left and right of previous established referents. This was an attempt to mark pronominals to the right and left, however was not always a successful marker and hence the analysis of a way to write LSM pronominals (Chapter 10).

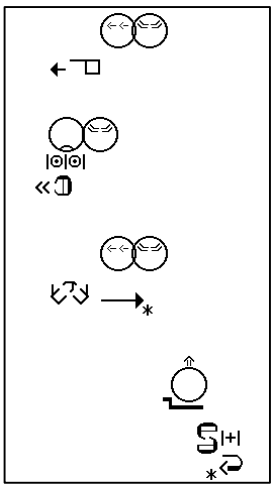
(132)  Ġ BAQRA TA-XELLUG (Ġ COW GIVE-LEFT) (Gakki 3)

In (133) the SW verb TA (GIVE) arrow glyphs move to the right side where the SW sign TIFLA (GIRL) is positioned in the first SW sign

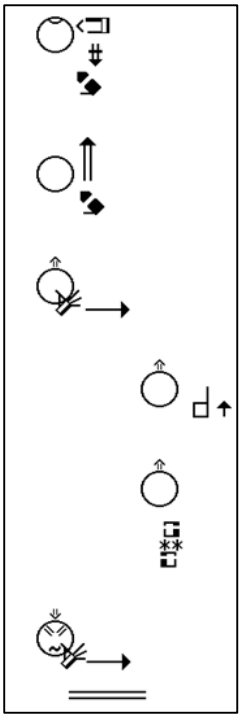
(133)  TIFLA-LEMIN ĦIET TA-LEMIN ĦIET TA-LEMIN (GIRL-LEFT SEW GIVE-LEFT SEW GIVE-LEFT) (Barnuza 2)

In (134) it can be seen that for 2nd person INTI (YOU) the use of vertical columns is employed in an attempt to encode this meaning. On the left column the father is

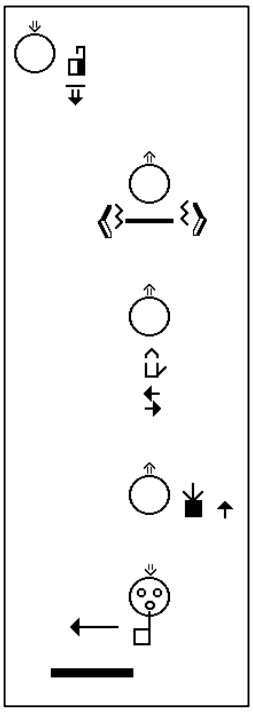
positioned and on the right the brother and his friends. The arrow of TA (GIVE) thus indicates the direction of movement from the left column to the right in order to clarify the giver and receiver in this SW clause.

(134)  DAN-XELLUG MOGĦŻA TA-LEMIN ĦBIEB (THAT ONE-LEFT GOAT GIVE-RIGHT FRIENDS) (Luqa15v29)

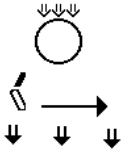
In (135) it can be seen that the arrow glyph in the third, and last SW sign SAQSA (ASK) is directed towards the right side of the vertical column in an attempt to modify the sign towards a pronominal point that is placed to the right side of the vertical column. In (136) the last SW sign QAL (SAY) has an arrow glyph that is directed towards the left column.

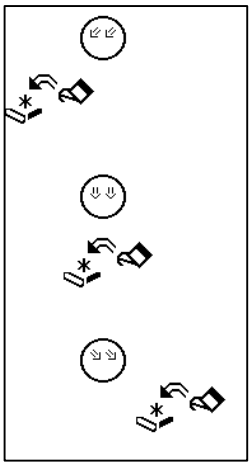
(135)  TIFEL KBIR SAQSA^{XELLUG} WIEĦED XOGĦOL^{LEMIN} SAQSA^{XELLUG}

(BOY BIG ASK^{LEFT} ONE WORK^{RIGHT} ASK^{LEFT}) (Luqa15v27)

(136)  HOOK^{XELLUG} FAIRY FEJN WENDY-QAL^{LEMIN} (HOOK^{LEFT} FAIRY

RIGHT WENDY SAID^{RIGHT}) (Peter 25)

In (137) vertical positioning to the left, right and centre is used as a method for writing spatial comparisons. Another method has been found in the LSM texts where the sign PLATT (PLATE) is modified and marked for three downward movements and three downward head-nods as in  (Nokk 02; Nokk 07).

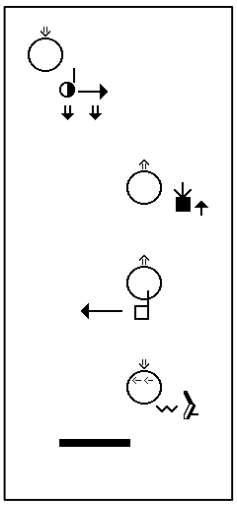
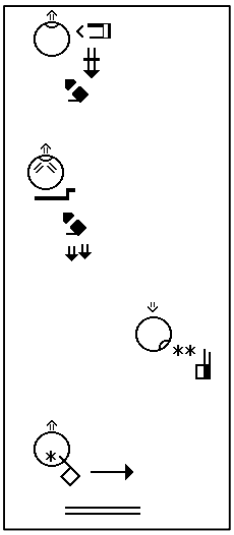
(137)  PLATT^{XELLUG}, PLATT$^{FIN\text{-}NOFS}$, PLATT^{LEMIN} (PLATE^{LEFT}, PLATE^{CENTRE}, PLATE^{RIGHT}) (Nokk 02)

The spatial positioning of the SW signs to the left and right in (137) and (138) and in all examples shown so far (except no. 137) there appears to be a relationship between the positioning of the signs vertically, and the syntactic relationship of subjects, verbs and objects.

In LSM the word order for *X qal lil Y (X say to Y)* is: X QAL Y (SVO). Y QAL X (SVO) brings about the opposite meaning. From the LSM texts it can be seen that Y X QAL (SOV) is possible however by spatial positioning of X and Y on different lanes. The arrow glyph showing the direction of the verb then determines the subject and

object. In (139) the boy is the subject who talks to his father. This is determined because the arrow of the verb QAL (SAY) is directed towards the sign PAPA (DAD). This is a SOV structure.

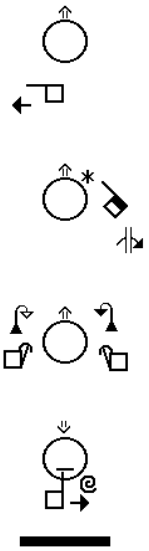
In (138) the order of the signs is OSV. This is only possible when the placement of the signs are positioned as can be seen in (136). This indicates that although horizontal writing could be used to write LSM in order to write syntactic structures other than SVO, for SOV and OSV a vertical layout is required and relative positioning of SW signs to the left, right and centre needs to be adopted.

(138)  (Peter 28) and (139)  (Luqa15v12)

6.8 HEAD-TILT PATTERNS

Patterns of head-tilt glyphs  and  have been used in some of the LSM texts of the LMAP to mark the beginning and end of different prosodic structures. In Section 9.7 this is discussed at more length, where it is argued that prosodic marking is not necessary for the writing of LSM texts. Here the data found is presented.

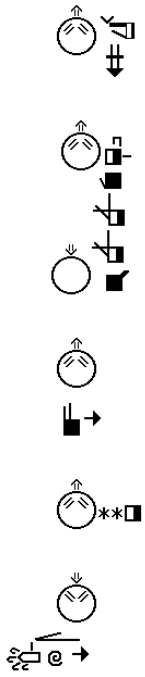
In (140 -146) there are UP-UP-DOWN patterns that mark statements. The head is tilted up on the first sign and on the following signs and tilted down on the last sign no matter how many signs are involved.



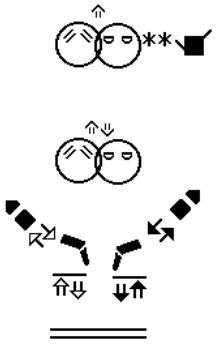
(140) (Barnuza 5)

(141) (Gakki 4)

In (143) the head tilt arrow glyph is an up-down arrow. This glyph was used to mark a phonetic detail. Since the sign BIEGⱧ (SELL) is a multiple syllable sign for the first part of the syllable the head-tilt is up and on the last syllable the head tilts down.

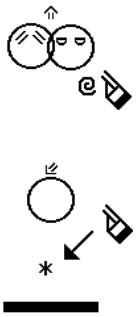


(142) (Gakki 1)

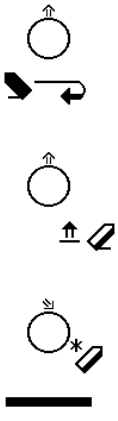


(143) (Gakki 2)

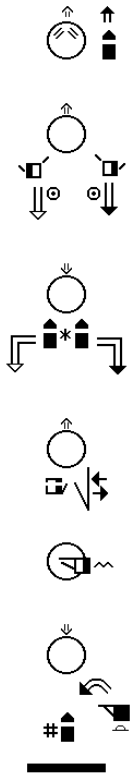
In (144) and (145) the last head tilt represents a phonetic detail that occurs during the articulation of SLEEP together with a downward head tilt. Although the target is a downward tilt the head is slanted downwards-to the side and this is seen represented in the last sign in (145).



(144) (Gakki 2)

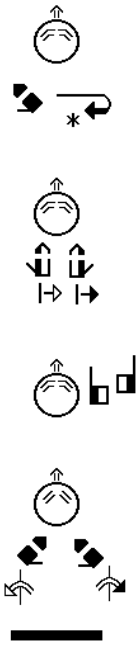


(145) (Peter 21)

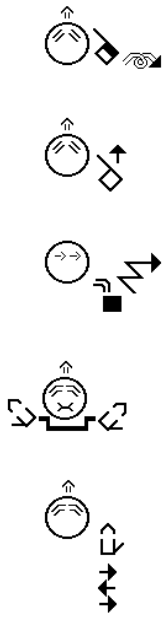


(146) (Gakki 15)

In (147-153) the head-tilt pattern is UP-UP-UP. This pattern has been used for prosodic structures of open-ended questions and exclamations. Facial expressions are also included to mark the differences between questions and exclamations, however no patterns in the SW of the LSM texts have been noted. (147) is a question ending in KIF (HOW).

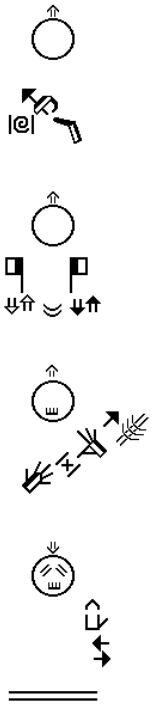


(147) (Luqa3v10)



(148) (Luqa15v4)

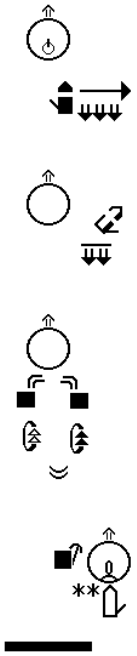
(149) (Luqa15v4)



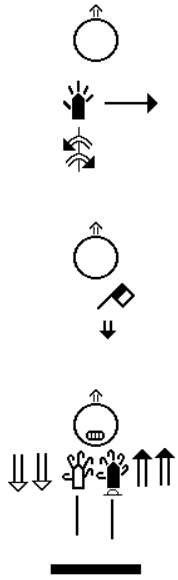
(150) (Zarbun 16)

(151) (Gakki 6)

(152) and (153) include UP-UP-UP head-tilts to mark exclamation prosodic structures.



(152) (Peter 10)

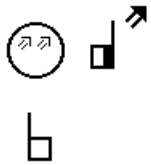


(153) (Peter 15)

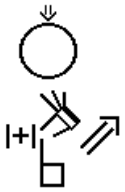
6.9 INCONSISTENCY IN SPELLINGS WITH ARROW GLYPHS

In Sections 6.5 and 6.6 it was seen how the spellings are inconsistent in the use of arrow glyphs. Here some other examples are presented. The argument held here is that since up and up-forward glyphs have been used inter-changeably (since both glyphs are used to show movement towards the same point in space), then only one glyph is required and should suffice for the reading of the LSM texts.

In (154-159) the up-down glyph (the arrow that represents movement on a vertical level) is used.

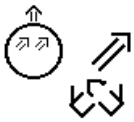


(154) CL-PERSUNA TELA' (CL-PERSON GO UP) (Luqa2v11)



(155) MAGĦŻUL-MINN ALLA (CHOSEN BY GOD) (Luqa2v11)

(156) CL-PERSUNA NIŻEL (CL-PERSON COME DOWN) (Luqa2v9)

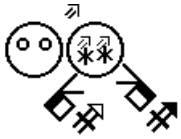


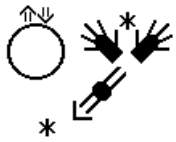
(157) TA (GIVE) (Luqa1v6)

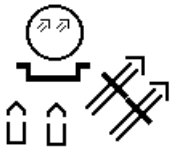
(158)  RĊIEVA (GIVE) (Luqa1v6)

(159)  RĊIEVA (GIVE) (Luqa2v40)

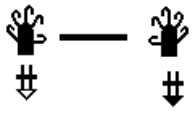
In (160-162) the up-down+forward glyph is used.

(160)  RA (SEE) (Luqa2v9)

(161)  SPIRTU SANTU NIŻEL (HOLY SPIRIT COME DOWN) (Luqa1v15)

(162)  TA-ALLA (GIVE-GOD) (Luqa2v23)

In (163-164) the forward glyph is used instead of the down-forward glyph. This indicates that the spelling for ORS (BEAR) does not need the down-forward glyph but can be written with forward arrow glyphs.

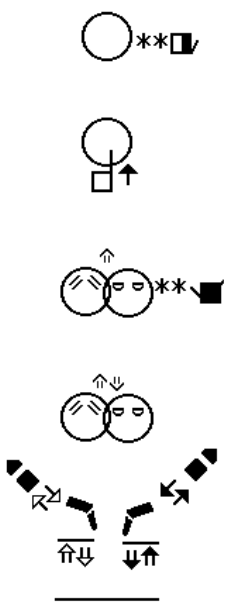
(163)  ORS (BEAR) (Nokk 12) (164)  ORS (BEAR) (Nokk 01)

In Section 8.7 the use of arrows for the writing of LSM is analysed further.

6.10 DIRECT DISCOURSE MARKERS

Direct discourse is often marked by the use of the verb QAL (SAY) in the LSM texts. In Section 7.7.1.4 the verb QAL is discussed in more detail and it is suggested that the facial expression that follows marks the direct discourse. The facial expression can be modified from neutral eye-brows up, to facial expressions marking emotions, such as anger, rage, concern/worry and happiness.

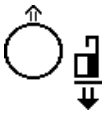
In (165) eyebrows up glyph is used to mark discourse. In first two signs no facial expressions have been used in order to mark the onset of discourse in the third sign.



(165) MAMA' QAL BAQRA BIEGꟾ (MUM SAYS COW SELL)(Gakki 2)

6.11 FINGERSPELLING AS SHORTENED SIGN NAMES

In the LSM texts, as in LSM signing, after the introduction to the names of people by fingerspelling the full names, these names are then often shortened down to just

one or two fingerspelt letters. It can be seen, however that at times the fingerspelt letter is ambiguous as it could read as a lexical sign that includes the same handshape, e.g. the sign  HOOK (Peter Pan 24) is very similar to Ġakki's shortened sign name 'Ġ' (166). Thus here it is proposed that a regular way of indicating that the handshape is a fingerspelt letter would help with the reading of the texts. **(197), (168) and (169) :**  **(Ġakki)**  **(Eliżabetta)**  **(Wendy) and**  **(Peter Pan).**

(166)  (Gakki 3) Ġ short for ĠAKKI

(167)  (Luqa1v24) E short for ELIŻABETTA

(168)  (Peter Pan 28) W short for WENDY

(169)  (Peter 32) PP short for PETER PAN

6.12 CONCLUSION

In this chapter the first part of the analysis of the LSM texts was carried out. Section 6.3 analysed the plurality of LSM signs in writing. Section 6.4 contains the analysis of

buoys used in the LSM texts. Sections 6.5 and 6.6 presented the analysis of pointing signs and pronouns. Section 6.7 analysed vertical columns and their syntactic function. The analysis of head-tilt patterns are presented in Section 6.8 and finally in Sections 6.9-6.11 the analysis of inconsistent arrow glyphs in spellings, direct discourse markers and fingerspelling for names in the reading of the LSM texts is carried out.

CHAPTER 7: ANALYSIS OF THE LSM TEXTS: LSM VERBS

7.1 INTRODUCTION

This chapter specifically analyses LSM verbs from the LSM texts. Section 7.5-Section 7.7 analyses and classifies the data found in the LSM texts into plain verbs, WE classifier verbs and agreement verbs. LSM SW verbs that included body-related meanings are analysed in Section 7.8. Section 7.9 looks briefly into LSM SW verbs that included facial expression glyphs. Finally Section 7.10 describes the use of the LSM sign DAR (HOUSE/HOME) in the written texts.

7.2 VERBS OR ANOTHER WORD-CLASS?

It can be argued that agreement verbs and whole entity (WE) classifier verbs are verbs due to the regular ways that these can be modified. Agreement verbs are modified (or inflected) for pronominal reference (Section 4.9), while WE classifier verbs are modified for aspect (Section 4.5). However a large number of verbs, categorized here as plain verbs (Section 7.3) do not show these behaviour patterns, and so they cannot be categorized as verbs on the basis of this alone.

Plain verbs could possibly be analysed as other word-classes such as nouns, adjectives or adverbs. It was decided to categorize these SW signs as verbs due to their syntactic position in an LSM sentence. A subject generally precedes these signs and an object often follows it (see Section 6.7) indicating that they might be verbal in nature. However if LSM is analysed as a subject- predicate language, then they could

be classified differently. This would mean that the predication following a subject could be any word-class. Despite the lack of conclusion concerning the nature of their class in this work these signs are referred to as verbs.

7.3 HEAD-GLYPH IN SPELLINGS

The data analysed here consists of spellings that very often include the head-glyph. The head glyph is included in the majority of spellings of signs in the LSM texts, because it was often used to contain prosodic markers that go beyond the level of the sign. Thus the head-glyph with prosodic marker is very often not part of the spelling of the LSM sign. In Section 9.7 it is proposed that LSM writing does not require prosodic marking. Thus unless the head is a salient feature of the sign it does not need to be written. The head glyph needs to be written when the head is the location that the handshapes start or end at. Additionally the head glyph needs to be included in the spelling of an LSM sign when signing in the area of the head-glyph brings about some semantic feature related to the meaning of 'head' (see Section 7.8).

The head-glyph also needs to be written in LSM when facial expressions are required to be represented (Section 7.9). At times the sign is modified to represent body-related meanings (see Section 7.8). When the body-related meaning of an LSM sign includes either the eyes, nose, mouth, ears or hair, then the head-glyph needs to be written together with the glyphs for eyes, nose, mouth, ears and hair.

Direct discourse is LSM is also marked with facial expressions and thus for the onset of direct discourse the head-glyph together with the facial expression glyph needs to be written. In LSM there also appears to be an adverbial intensifier that has often been represented by use of the 'blow air-out' glyph  (Section 7.6). When this intensifier needs to be represented the head-glyph needs to be written.

7.4 DATA REGARDING LSM VERBS

Section 6.2 provides full details of where the data can be found and how it can be accessed. The full list of the LSM texts that were analysed from the LMAP can be also be found in Chapter 5, Section 5.2.

Full details on the different verb types and reasons for adopting this framework are found in Section 4.3. In this work 'plain verbs' refer to those signs that appear to be verbal however do not move to three-pronominal points in space like agreement verbs, nor do they behave like WE classifiers that are modified for aspect. The data concerning these verbs is found in Section 7.5.

'Whole Entity classifier verbs' consist of whole entity classifier handshapes and movements that show details of how that movement was carried out, hence aspectual modifications. Data found in the LSM texts regarding WE classifiers is found in Section 7.6.

Agreement verbs consist of a list of signs that are modified to incorporate a three-person distinction that is marked in the signing space by referential points. The data

concerning agreement verbs is presented and analysed in Section 7.7. Agreement verbs are free to move to the different referential points, however there are different types of 'freedom' of the hands to move. Some signs start with the hands anchored at a location and these are called 'anchor-initial'. Other signs known as 'anchor-final' end with the hands at an anchored location. There are some signs that do not have an anchored beginning or end position and these are known as 'free agreement verbs'.

So the classification used in this work is that of 'Plain Verbs', 'Whole-Entity classifier verbs' and 'Agreement verbs'. This classification of LSM verbs is useful, however for many verbs there is an overlap of the different categories. For instance in (308) and (309) TA MAZZ-FLUS a classifier handshape is fused with an agreement verb TA. The behaviour of the verb determines whether it is a classifier or agreement verb. Since the verb is seen to be modified for pronominal referential points (it moves towards these points) then such a verb is classified as an agreement verb.

7.5 PLAIN VERBS

Plain verbs are classified according to what they are not, rather than what they are. Agreement verbs are signs whose movements are modified to be directed to pronominal points in the neutral space. Whole entity (WE) classifier verbs are signs that involve classifier handshapes and path movements that are not inflected to pronominal points, but that are visibly meaningful in themselves since they mimic real-life movements. Plain verbs are neither one of these verbs, rather they appear to be 'frozen' in the sense that their movements are not modified by movement

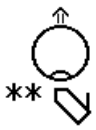
towards points in the signing space and neither do they contain movements that are meaningful that represent the actual movement of a whole entity (see also Section 4.8).

Plain verbs are subdivided into arbitrary, metaphorical and handle/iconic verbs. Handle verbs are often categorized as classifier verbs, since the handshapes involved often represent the shape of the real-life grasping hand.

7.5.1 Arbitrary Plain Verbs

A large number of plain verbs appear to be arbitrary and non-iconic. From the LMAP a list of plain arbitrary verbs have been analysed and can be seen in numbers (170-194) below. If the origin of these signs is traced back it is highly likely that these arbitrary signs had an iconic link to the real-world. However this link appears to have been lost with time and the changes that occur in ideas and culture. For instance the sign GĦAMEL (DO) (177-179) possibly has its origin in some tool activity, but over the years the link between the real-life action and the sign has been lost.

The numbers in this chapter of the data continue from Part 1 of the analysis in Chapter 5.

(170)  ĦABB (LIKE) (Barnuza 4)

(171)  ĦABB (LIKE) (Peter 06)

(172)  XTAQ (WISH) (Gakki 3)

(173)  XTAQ (WISH) (Gakki 8)

(174)  XTAQ (WISH) (Nokk 09)

(175)  XTAQ (WISH) (Pass 02)

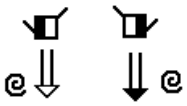
(176)  XTAQ (WISH) (Luqa1v38)

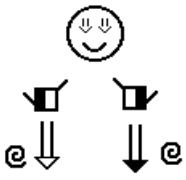
(177)  GĦAMEL (TO DO) (Mass 03 06)

(178)  GĦAMEL (TO DO) (Liturgija 1)

(179)  GĦAMEL (TO DO) (Kredu 08)

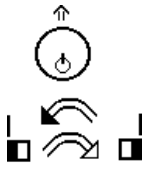
(180)  AĊĊETTA (ACCEPT) (Luqa1v45)

(181)  POĠĠA (SIT DOWN) (Nokk 09)

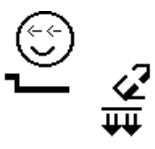
(182)  POĠĠA (SIT DOWN) (Nokk 09)

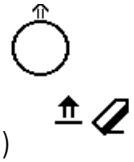
(183)  GRAZZI / RRINGRAZZJA (THANK YOU/ TO THANK) (Liturgija 3)

In (184) the origin of this plain verb can be traced to two classifier handshapes that take each other's place. This contains the meaning of 'change', thus the original sign has been extended to refer to a more abstract concept.

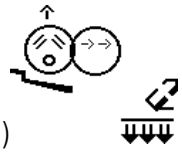
(184)  BIDDEL (2) (TO CHANGE) (Liturgija 2)

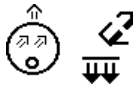
(185)  AĦDEM /XOGĦOL (TO WORK) (Liturgija 3)

(186)  TELAQ (LEAVE) (Peter 03)

(187)  MAR (GO) (Peter 21)

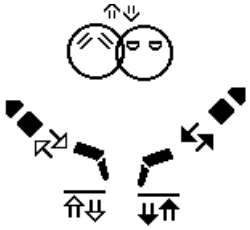
(188)  ĦARAB (RUN-AWAY) (Barnuza 24)

(189)  ĦARAB (RUN-AWAY) (Peter 32)

(190)  TELAQ (LEAVE) (Peter 33)

(191)  ĠĠIELED (FIGHT) (Peter 33)

The SW verb in (192) could be written without the head glyphs and facial expressions (section 7.3) and without the handshape glyphs indicating their end position. A simpler written SW LSM verb for BIEGĦ (SELL) proposed here is: 

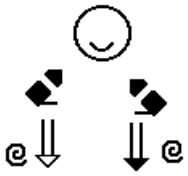
(192)  BIEGĦ (SELL) (ĠAKKI 2)

(193)  ĦALAQ (CREATE) (Kredu 03)

(194) BEDA (START) (Kredu 06)

7.5.2 Metaphorical Plain Verbs

Some plain verbs appear to be metaphorical in nature. For instance the LSM sign TILEF (LOSE) (206) consists of hands holding onto something and then letting go. OBDA (OBEY) (199) (201) is another example where the hands start at head area and move downwards that may be interpreted as a metaphor of offering one's mind. The signs are partially iconic, i.e. they can be understood metaphorically. The signs have been displaced from their original meaning and extended to refer to other related concepts. Metaphorical plain verbs found in the LSM texts can be found in this section.

(195)  KKALMA (CALM DOWN) (Nokk 12)

(196)  WERA (SHOW) (Salve 04)

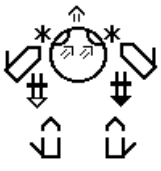
(197)  ĦA ĦSIEB (TAKE CARE OF) (Luqa2v8)

(198)  BATA (SUFFER) (Kredu 11)

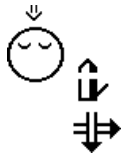
(199a)  OBDA (OBEY) (Luqa1v38) (199b)  OBDA (OBEY) (Luqa1v6)

(200)  FARFAR-RESPONSABILITA' (TO DECLINE ANY RESPONSIBILTY) metaphor (Mass 03 08)

Although (201) is not an agreement verb, since the hands do not move to a different location, the eye-gaze glyph that is directed to the top right side as can be seen in the spelling of (201) may indicate that for plain verbs this eye-gaze glyph may function as a marker of referential points. Other examples can be found in (208), (209) and (212).

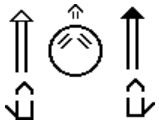
(201)  OBDA (OBEY) (Luqa1v15)

(202)  OBDA (OBEY) (Luqa2v39)

(203)  MIET (DIE) (Barnuza 31)

In (205) the sign that precedes this is MEWT (DEATH) and thus together as a compound sign it means QAM MIL-MEWT (RESURRECT).

(204)  QAM (RISE) (Luqa1v39)

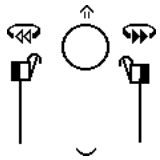
(205)  QAM (ARISE) (Kredu 11)

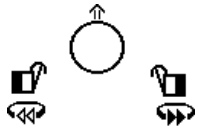
(206)  TILEF (LOSE) (Luqa15v27)

(207)  ĦNIENA (TO HAVE MERCY) (Mass 03 10)

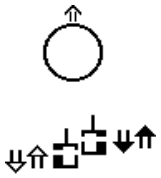
(208)  FAĦĦAR-ALLA (TO PRAISE-GOD) (Gloria 1 D)

(209)  RISPETT-ALLA (TO RISPECT-GOD) (Gloria 1 D). (The eye-gaze morpheme ‘object marker’: YOU/GOD)

(210)  GGLORIFIKA (GLORIFY) (Gloria D)

(211)  ĊĊELEBRA (CELEBRATE) (Mass 03 02)

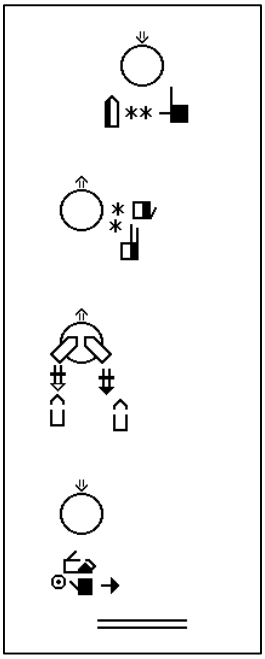
(212)  FAĦĦAR-LILEK/ALLA (TO PRAISE YOU GOD) (Liturgija 1)



(213) FAĦĦAR (TO PRAISE) (Liturgija 3)

The original real-life link can still be identified in the action of wiping a slate clean in (214), however the LSM sign no longer refers to this action alone but has been extended to include the meanings of FORGIVENESS, CLEAN. Additionally the sign is also used as a lexical marker of the past in LSM. This can be found extensively in the LSM texts. One example from the LSM texts is provided in (215).

(214)  ĦASSAR (TO ERASE) (Mass 03 08; Mass 04 Glorja 2)

(215)  LIĠI ĠENITURI OBDA LEST (LAW PARENTS OBEY READY) (Luqa2v39)

7.5.3 HANDLE/Iconic Plain verbs

Some plain verbs could also be categorized as HANDLE classifier verbs (see Section 4.7). Likewise, verbs listed in the HANDLE category could also be categorized as plain verbs. The link between real-life entity and the sign is more direct for these verbs than those classified as arbitrary or metaphoric signs (Sections 7.5.1 and 7.5.2).

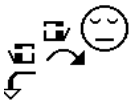
Classifier Handle verbs are part of plain verbs, since they are not WE classifier verbs that move, nor do they inflect to pronominal points. Handle classifiers are verbs that consist of handshapes that mimic the real-life grip, placement or configuration that hands make during the real-life action represented by these signs.

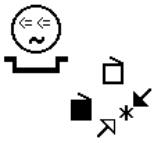
7.5.3.1 A-Handshapes

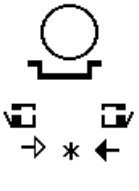
A-handshape glyphs represent the closed fist grip on objects and instruments. A list of plain handle verbs are listed here from (216)–(228). All verbs are iconic of the

real-life closed-fist grip and movement involved in real-life. For instance (216) ĦARAT (DIG) represents the actual digging, (217) the opening of cupboard doors, (220) and (221) TA DAQQA TAS-SIKKINA the grip and movement of a stabbing knife, (223) holding a lantern at head-level, (224) INĊENS (INCENSE) is produced by the iconic activity of swinging the incense container during religious rituals.

(216)  GĦALQA/ ĦARAT (FIELD/DIG) (Luqa15v25)

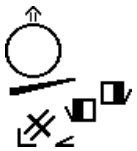
(217)  FETAĦ ARMADJU (OPEN CUPBOARD) (Gakki 5)

(218)  GĦALAQ ARMADJU (OPEN CUPBOARD) (Gakki 9)

(219)  GĦALAQ ARMADJU (OPEN CUPBOARD) (Gakki 15)

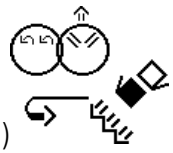
(220)  TA DAQQA B'INSTRUMENT LI TAQBAD B'IDEK (STRIKE WITH AN INSTRUMENT THAT YOU CLASP IN YOUR HAND) (Luqa15v27)

(221)  DAQQA-SIKKINA (STAB) (Mattew2v13)

(222)  TA DAQQA B’IDEJK IT-TNEJN (STRIKE WITH AND INSTRUMENT YOU HOLD WITH TWO HANDS) (Barnuza 31)

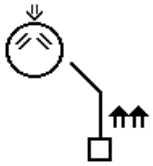
(223)  FITTEX BIL-LAMPA F’ID (SEARCH WITH LAMP IN HAND) (Luqa15v8)

(224)  SWING INCENSE (Mattew2v11)

(225)  KINES (SWEEP) (Luqa15v8)

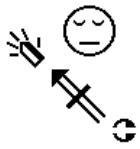
(226)  ĦAWWAD-BORMA (STIR) (Nokk 02)

Unlike the previous SW signs of A-handshape plain handle verbs, numbers (227) and (228) do not show the thumb in the glyph. It has been noticed from the reading of the texts that the thumb part of the glyph is essential to determine the orientation of the palm, and without it would make the sign very difficult to read.

(227)  ŻAMM-BASKETT (HOLD-BAG) (Barnuza 7)

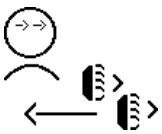
(228)  TITĦAN (TO GRIND) (Liturgija 3)

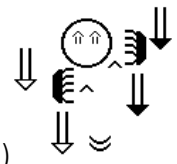
In (229) the glyph used in the spelling is a circle rather than a closed fist. This is categorized here since the circle is a closed fist glyph representing a very similar handshape. The end position is the open B-hand. However the verb is categorized as an A-handshape handle verb, since the beginning syllable is a closed fist.

(229)  WADDAB (THROW) (Gakki 5)

7.5.3.2 B-Handshapes

Handle verbs here are written with B-handshape glyphs. The B-handshape is representative of the hand that is in an open position gripping larger objects or instruments that cannot be held in a fist (7.5.3.1) or with two fingers (7.5.3.3). In (230) and (231) the handshape glyphs represent this position.

(230)  QABAD XI ĦAGA B'ŻEWĠ IDEJN (CATCH SOMETHING WITH TWO HANDS) (Barnuza 32)



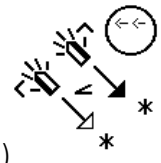
(231) TELA’ B’IDEJH (ROCK CLIMB) (Gakki 6)

In (232) the movement and contact glyph represent the real-life slicing action, however the handshape glyph does not represent the hand that grips the instrument but rather the instrument itself.

It was noticed that (232) and (228) was difficult to read. This may indicate that for handle verbs the inclusion of the head glyph with facial expression glyphs may helpful for the reading of LSM Handle classifier verb spellings. The handshape glyphs represent the real-life grip on objects and instruments and thus the head glyph may be useful in reading these signs as Handle classifier verbs.

(232)  ISLAJSJA (SLICE) (Fellus 01)

Sign (233) is a verb that can be modified to include body-related meanings (Section 7.8). The hands in ĦATAF (SNATCH) move towards and end in contact with the chest in (233) (235), whereas in (234) the same handshape ends at the mouth location and thus includes a mouth-related activity, in this case eating. Section 7.8 describes a more complete list of verbs modified to incorporate body-related meanings.



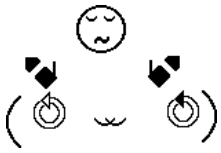
(233) ĦATAF (SNATCH) (Peter 11; Peter 30)

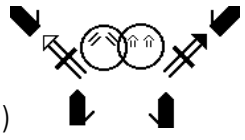
(234)  ĦATAF-FIL-ĦALQ (SNATCH INTO MOUTH) (Barnuza 29)

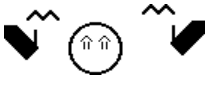
(235)  ĦATAF (SNATCH) (Peter 23)

The signs in (236)-(246) could possibly be re-classified as a different group of signs, since the handshape glyphs do not represent the hand gripping or holding an object/instrument. Rather the handshape glyphs in all these signs represent the real-life configuration of hands involved in these actions. However there are not enough examples in the LSM texts to classify these signs and hence they are included here.

In (236) the B-handshapes represent the legs of a turtle that swims. The hand glyph represents the real-life limbs of a turtle and thus are categorised as HANDLE verbs here. In (237) and (238) the B-hand represents how human hands would be configured when flying. In (239) the hands are in the shape that are held during the gesture produced for stopping someone.

(236)  GĦAM (SWIM) (Pass 02)

(237)  TAR ‘L FUQ (FLY ABOVE) (Zarbun 05)0

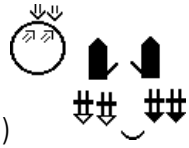
(238)  TAR (FLY) (Zarbun 06)

(239)  WAQAF (STOP) (Barnuza 9)

In (240) the handshape glyphs represent how hands are held during prayer. In (242) the handshape glyphs represent the way hands are held during adoration. (244) and (245) both represent the way the hands are held during these actions of picking someone up and playing the flute.

(240)  TALAB (TO PRAY) (Mass 03 06; Mass 03 09)

(241)  TALAB (TO PRAY) (Liturgija 3)

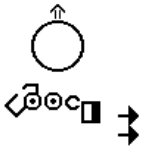
(242)  ADURA-ALLA (TO WORSHIP-GOD) (Gloria 1 Dodo)

(244)  ĠABAR (PICK UP) (Peter 18)

(245)  DAQQ-FLAWT (PLAY-FLUTE) (Luqa15v25)

7.5.3.3 G-handshape and F-handshape

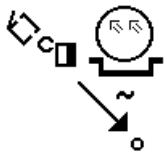
The G and F handshapes are similar although they appear to be very distinct as glyphs. When the three fingers of the F-handshape are closed the result is the G-handshape. In fact in the ISWA 2010 these two distinct glyphs are categorized together as handshapes of Group 6 (see Chapter 2). Both handshape glyphs are iconic of the grip made with index-finger and thumb on objects and instruments.

(247)  KITEB (WRITE) (Luqa2v3)

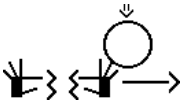
(248) is similar to the verb TIE-HOOD (no. 453), however this is unrelated to the body and occurs in neutral space, meaning that something/someone is tied, and there is no semantic relation to the body. As was seen for the sign ĦATAF (SNATCH) this sign can be modified to include body-related meanings.

(248)  RABAT (TIE) (Peter 11)

(249)  KIEL BL-IMGĦARFA MINN PLATT (EAT WITH A SPOON FROM BOWL) (Nokk 02)

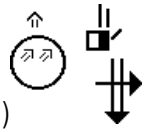
(250)  SPARA (SHOOT) (Peter 07)

(251)  ĦIET (SEW) (Barnuza 3)

(252)  INXAR (HANG-CLOTHES) (Zarbun 06)

The signs in (253) to (255) are produced and thus written with a different handshape, the 8-handshape glyph. (253) and (254) are handshapes and movements that mimic the exact way a blessing is formally carried out. (255) happens to use the same handshape used in the sign FLUS (MONEY).

(253)  BIEREK (BLESS) (Salve 04)

(254)  BIEREK (BLESS) (Gloria 1 D)

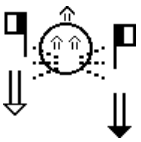
(255)  BERBAQ (WASTE MONE) (Luqa15v13)

7.6 WHOLE ENTITY (WE) CLASSIFIER VERBS

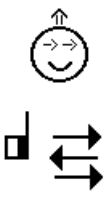
In this work the three type classifier system (Schick, 1990) is used as a framework for analysing the LSM written data (see also Section 4.4.2). This system identifies three types of classifiers Whole Entity (WE) classifiers, Handle classifiers and Size and shape specifiers. In this section data concerning WE classifiers are analysed. These are also termed 'spatial verbs' (Section 4.3). From the LSM data it can be seen that Handle classifier verbs (section 7.5.3) behave very differently to these WE verbs analysed here.

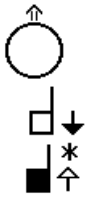
7.6.1 CL-ENTITA' IRQIQA (CL-THIN ENTITY)

This index finger glyph represents a classifier handshape that is used for small and thin objects. The glyph is used to represent the classifier handshape of small things that are far away, such as flying in the sky (256). It is also used in upright position as the representation of a person, such as in (258)-(261).

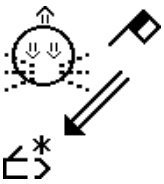
(256)  ŻEWĠ ZRABEN-INDEX-CLASSIFIERS WAQA' (TWO SHOES-INDEXCLASSIFIERS FALL) (Zarbun 13)

(257)  CL-PERSUNA WAQA' (CL-PERSON FALL) (Zarbun 14)

(258)  ĠEJ U SEJJER (COME AND GO) (Barnuza 1)

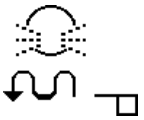
(259)  CL-PERSUNA-CL-PERSUNA LTAQA’ (CL-PERSON-CL-PERSON MEET)

(Gakki 3)

(260)  CL-PERSUNA WAQA’ FUQ CL-ĊATT (CL-PERSON FALL ON CL-FLAT)

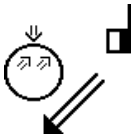
(Zarbun 15)

(261)  CL-PERSUNA FUQ CL-ĊATT NIŻEL (CL-PERSON ON CL-FLAT COME DOWN) (Luqa21v27)

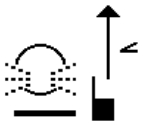
(262)  CL-ENTITA’ ŻGHIRA SSERREP (CL-THIN ENTITY SLITHER) (Pass 08)

(263)  CL- ENTITA’ ŻGHIRA TAR FUQ (CL- THIN ENTITY FLY UP) (Peter 32)

(264)  CL- ENTITA’ IRQIQA ĦAREĠ MINN CL-ĦAĠA GĦAT-TOND (CL- THIN ENTITY COME OUT OF CL-ROUND OBJECT) (Fellus 03)

(265)  CL-PERSUNA NIŻEL MIS-SEMA’ (CL-PERSON COME DOWN FROM SKY) (Kredu 09)

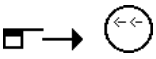
(266)  CL-PERSUNA TELA’ S-SEMA’ (CL-PERSON GO UP TO SKY) (Kredu 12)

(267)  CL-PERSUNA MAR (Nokk 20)

(268)  CL-PERSUNA WAQA’ (CL-PERSON FALL) (Peter 09)

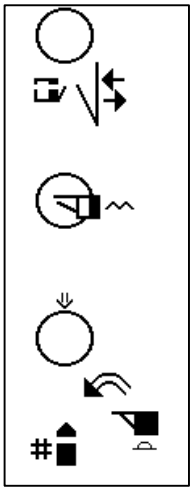
(269)  CL-PERSUNA WAQA’ (CL-PERSON FALL) (Zarbun 09)

(270)  CL-PERSUNA QABEŻ (CL-PERSON JUMP OVER) (Zarbun 10)

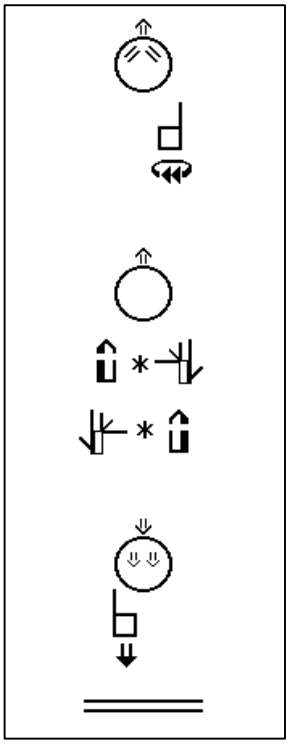
(271)  CL-PERSUNA MEXA DRITT (CL-PERSON MOVE STRAIGHT)(Zarbun 10)

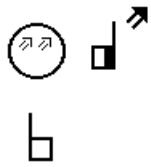
(272)  CL-ĊATT TELA’ U GĦOLLA CL-PERSUNA (CL-FLAT OBJ MOVE UP AND LIFT UP CL-PERSON) (Peter 09)

In (273) prepositional meaning ‘FUQ (UP)’ in TIĠIEĠA TELA’-FUQ MEJDA (CHICKEN MOVE ONTO TABLE) emerges from the relative positioning of the two classifier handshape-glyphs and the direction of the movement arrow glyph.

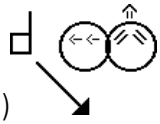
(273)  TIĠIEĠA FUQ CL-ĊATT (CHICKEN ON CL-FLAT) (Gakki 15)

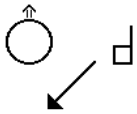
In (274) and (275) the index handshape glyph is ambiguous. Thus it is recommended to place a tense symbol underneath the WE classifier glyph. This helps clarify its function as a WE classifier in the word/sign/utterance.

(274)  MIN ĠESU’ DAN (WHO JESUS THIS) (Luqa2v11)

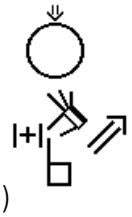


(275) CL-PERSUNA TELA' U TBIEGĦED MINN CL-PERSUNA (CL-PERSON GO UP AND AWAY FROM CL-PERSON) (Luqa 2v11).



(276a) ĠIE (COME) (Peter 35) and (276b)  ĠIE (COME) (Peter 02)

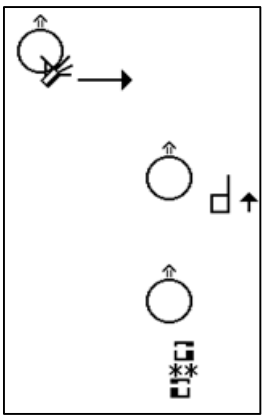
In Section 7.4 it was mentioned how sometimes a sign could be classified into more than one class. (277) is an example of this, where mixed classifier verbs can be seen here. Here both a WE-classifier handshape and a HANDLE classifier are combined. Having different LSM classifiers combined into one sign/word was also noted by Galea (2006). Another example is (272), where the index glyph represents a whole entity classifier while the B-hand represents the palm that catches and this could be classified as an agreement verb (Section 7.7).



(277) CL-PERSUNA MAGĦŻULA (CL-PERSON CHOSEN) (Luqa2v11)

In the LSM texts the classifier handshapes have never been marked in some way to indicate that they are classifiers. In (278) the second sign  is ambiguous. It could refer to the LSM classifier CL-PERSUNA (CL-PERSON) or else to the lexical sign

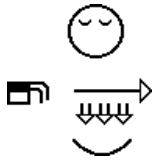
WIEĦED (ONE). Here it is argued that the insertion of the tense glyph ~ in the spelling of classifier handshapes may help to disambiguate between other similar non-classifier LSM signs.

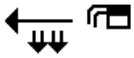
(278)  SAQSA^{XELLUG} DAN XOGĦOL^{LEMIN} (ASK^{LEFT} CL-PERSON WORK^{RIGHT}) (Luqa15v27)

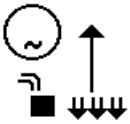
All movement glyphs for CL-ENTITA' IRQIQA (CL-THIN ENTITY) are either up-down (i.e. vertical plane-based) or forward-back movement glyphs (i.e. horizontal plane-based). These are then modified to be directed diagonally such as (276) and (277). In (261) there is back-down movement. It is argued in Section 6.9, that these back-down-up and forward-back-up movement glyphs may be unnecessary for the writing of LSM.

7.6.2 CL-OĠĠETT ANIMAT (CL-ANIMATE OBJECT)

In this section further movement glyphs were found. In (279)-(286) the bouncing movement glyph was used to represent walking and bouncing and (287) and (288) consist of swirling movements. Other movement glyphs found here have been described in Section 7.6.1, i.e. up-down, forward-back movements. There is also one example of up+forward in (298) used also in (261).

(279)  CL-OĠĠETT ANIMAT MEXA (CL-ANIMATE OBJECT WALK) (Pass 02)

(280)  CL- OĠĠETT ANIMAT MEXA (CL-ANIMATE OBJECT WALK) (Nokk 12)

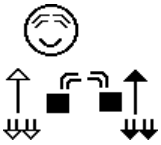
(281)  CL- OĠĠETT ANIMAT MEXA (CL-ANIMATE OBJECTWALK) (Barnuza 8, 11)

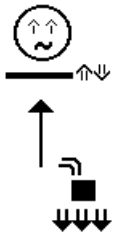
(282)  CL- OĠĠETT ANIMAT MEXA JOQMOS (CL-ANIMATE OBJECT WALK BOUNCE) (Luqa15v25)

In (283) the movement glyph used is different to the glyph-combination seen in (279)-(282). Perhaps this glyph could be replaced by the one used in (279-289). This indicates one of the many ways that similar SW glyph-forms can be used to express the same entity.

(283)  CL- OĠĠETT ANIMAT MEXA JOQMOS (CL-ANIMATE OBJECT WALK BOUNCE) (Pass 02; 03)

(284)  CL-OĠĠETT ANIMAT MEXA JOQMOS (CL-ANIMATE OBJECT WALK BOUNCE) (Luqa15v25)

(285)  CL- OĠĠETT ANIMAT MEXA FLIMKIEN (CL-ANIMATE OBJECT WALK TOGETHER) (Barnuza 17)

(286)  CL- OĠĠETT ANIMAT MEXA RILASSAT (CL-ANIMATE OBJECT WALK RELAXED) (Gakki 3) Here the tense glyph on the head indicates ‘relaxed movement’.

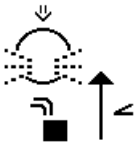
(287)  CL- OĠĠETT ANIMAT TELA’ JSERREP (CL-ANIMATE OBJECT MOVE UP SWIRL) (Nokk 11)

(288)  CL- OĠĠETT ANIMAT TELA’ JSERREP (CL-ANIMATE OBJECT UP SWIRL) (Gakki 12)

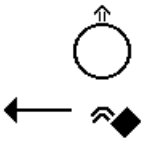
(289)  CL- OĠĠETT ANIMAT TELA’ (CL-ANIMATE OBJECT GO UP) (Nokk 16)

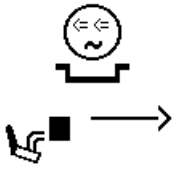
(290)  CL-OĠĠETT ANIMAT NIŻEL MGĦAĠĠEL (CL-ANIMATE OBJECT MOVE DOWN FAST) (Nokk 20)

(291)  CL- OĠĠETT ANIMAT QABEŻ MINN CL-ĊATTA (CL-ANIMATE OBJECT JUMP FROM CL-FLAT SURFACE) (Nokk 20)

(292)  CL- OĠĠETT ANIMAT MEXA (CL-ANIMATE OBJECT WALK) (Barnuza 9)

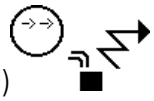
(293)  CL- OĠĠETT ANIMAT ĠERA (CL-ANIMATE OBJECT RUN) (Pass 04)

(294)  CL- OĠĠETT ANIMAT MEXA (CL-ANIMATE OBJECT MOVE) (Luqa2v39)

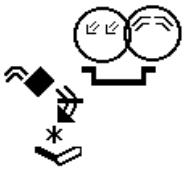
(295)  ID MEXA B'CL- OĠĠETT ANIMAT ĠO FIH (MOVE PALM WITH CL-ANIMATE OBJECT INSIDE IT) (Gakki 9)

(296) shows how prepositional meanings in LSM are sometimes expressed. The glyphs represent different entities and their relative position to one another brings about prepositional meaning. In (296) since the animate object glyph is written on top of the sign for 'house' it means 'animate object on top of the house', i.e. on the roof top. Another example can be seen in (300). SW makes it possible to allow for this flexibility of relative placement of glyphs (see Section 2.8 for more).

(296)  CL- OĠĠETT ANIMAT -FUQ DAR (CL-ANIMATE OBJECT ON HOUSE) (Zarbun 12)

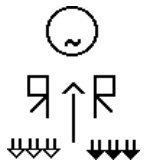
(297)  CL-OĠĠETT ANIMAT ŻIGUŻAJG 'L QUDDIEM (Luqa15v4)

Sign (298) is another example of a mixed classifier verb WE classifier and handle classifier (hold in palm of hand), observed to occur in LSM (Galea, 2006).

(298)  CL- OĠĠETT ANIMAT JINŻEL FIL-PALA TAL-ID (CL-ANIMATE OBJECT MOVE INTO PALM) (Gakki 9)

7.6.3 CL-SAQAJN (CL-PERSON LEGS)

All movement glyphs have already been used for the spellings of other WE classifiers (Sections 7.6.2 and 7.6.1). Here another movement that has not yet been described is the back and forth circular movements of dancing. This is represented by a repeated curved movement in (301). Also the finger movement of the glyph can be seen for the first time in the spelling of (302). This is iconic of the leg movement involved in walking.

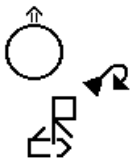


(299) MEXA-MEXA FLIMKIEN (WALK WALK TOGETHER) (Pass 01)

(300) CL-SAQAJN PERSUNA-FUQ DAR (CL-PERSON LEGS ON HOUSE) (Zarbun 06)

(301) CL-SAQAJN PERSUNA ŻIFEN (CL-PERSON LEGS DANCE) (Luqa15v25)

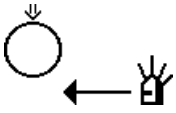
(302) CL-SAQAJN-PERSUNA MEXA-PASSIĠĠATA (CL-LEGS PERSON WALK-STROLL) (Nokk 03). Could this be classified as verbal due to eye-gaze and facial expression?

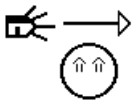
(303)  WAQA’ MINN FUQ XI ĦAĠA ĊATTA (FELL FROM FLAT SURFACE) (Peter 19)

(304)  WAQA’ MINN FUQ XI ĦAĠA ĊATTA (FELL FROM FLAT SURFACE) (Peter 33)

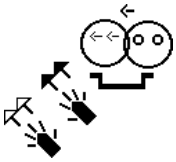
7.6.4 CL-GRUPP (CL-GROUP)

The 4-handshape and B-handshape glyphs here represent the B-hand and 4-hand classifier handshapes that are used for groups and crowds of people or animals. No new movement glyphs were found here.

(305)  CL-GRUPP ĠIE (CL-GROUP ĠIE) (Mattew2v3)



(306) CL-GRUUPP ITIR L’ FUQ (CL-GROUP FLY ABOVE) (Peter 05)



(307) CL-FOLLA MAR-MAR (CL-CROWD GO-GO) (Luqa15v1)

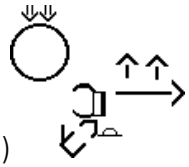
7.6.5 CL-MAZZ (CL-STACK)

In this section some WE classifiers that use the open-C glyph and the baby-C glyph (that indicates the thumb and index finger only) are presented. This classifier

handshape is used to represent the shape and size of some entity such as a stack of money (308). The baby C is used to represent a small object in the same way seen in Section 7.6.1.

(308)  TA CL-MAZZ FLUS (GIVE CL-STACK OF MONEY) (Luqa15v12)

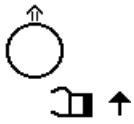
(309) and (311) the signs are mixed with both a WE-classifier and an agreement verb (Section 7.7). The verb moves towards pronominal points and is thus categorized as an agreement verb. However the same verb can contain a different behaviour. In (310) the WE-classifier handshape closes and this creates the meaning of its size shrinking, meaning the stack of money shrinks to nothing. In such a case under which category is this verb best placed?

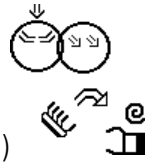
(309)  TA TA MAZZ-FLUS (GIVE GIVE CL-STACK MONEY) (Luqa15v12)

(310)  CL-MAZZ FLUS NIŻEL (CL-STACK OF MONEY GOES DOWN) (Luqa15v14)

(311)  CL-MAZZ FLUS TA LILI (CL-STACK OF MONEY GIVE ME) (Luqa15v12)

(312)  CL-OĠĠETT ŻGĦIR (CL-SMALL OBJECT) (Mattew2v2)

(313)  CL-ENTITA’ ZGĦIRA (CL-SMALL ENTITY) (Peter 06)

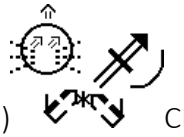
(314)  CL-KONTENITUR GĦATTA CL-ENTITA’ ZGĦIRA (CL-CONTAINER COVER CL-SMALL ENTITY) (Peter 26)

7.6.6 Classifier Handshapes from Lexical Signs

Some lexical signs are very similar to WE classifier handshapes (such as ĦUTA/FISH). Others are reduced in form from two hands to one hands (e.g. VAPUR/SHIP and SPRITU S-SANTU/HOLY SPIRIT) and then are able to move freely like WE classifier handshapes. These classifier handshape are listed here. No new movements have been found here and all movements have been described in Sections 7.6.1-7.6.5. In (316) the up+forward (arrows representing movement on a vertical plane) movement glyph is used.

7.6.6.1 DGĦAJSA (CL-BOAT)

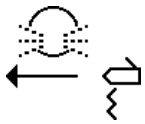
(315)  CL-DGĦAJSA JIĊAQLAQ ‘L QUDDIEM (CL-BOAT MOVE FORWARD) (Peter 12; Peter 17)

(316)  CL-VAPUR JTIR ‘L FUQ (CL-SHIP FLY UP) (Peter 33)

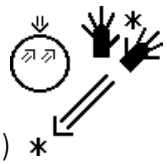
7.6.6.2 CL-INSETT (CL-INSECT)

(317)  CL-OĠĠETT ZGĦIR GĦAT-TOND TAR (CL-SMALL ROUNDISH OBJECT FLY) (Pass 05)

7.6.6.3 CL-ĦUTA (CL-FISH)

(318)  CL-ĦUTA GĦAM (CL-FISH SWIM) (Pass 07)

7.6.6.4 CL-SPIRTU (CL-SPIRIT)

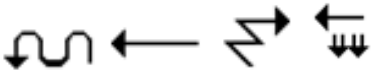
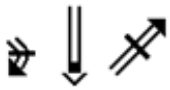
(319)  CL-SPIRTU SANTU NIŻEL FUQ ĠISEM (CL-HOLY SPIRIT COME DOWN ONTO BODY) (Kredu 10)

7.6.7 Movement Glyphs for WE classifiers

A synthesis of the movement glyphs found in the data is carried out here. Although it is often thought that the WE movements are immeasurable (Liddell, 2003b), from the LSM data a small list of movements can be found. These can be modified for size and rotation (Section 2.5 and 2.7.2). The full list of WE classifier movements can be seen in Figure 7.1.

Figure 7. 1: Movement glyphs found in the LSM texts for Whole Entity classifiers

1		Up-down movements

2		Forward-back movements
3		Up-down+forward-back movements

It is argued that the glyphs in no. 3 of Figure 7.1 are not required since the reading of Whole Entity verbs do not require this distinction (Section 6.9).

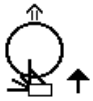
7.7 AGREEMENT VERBS

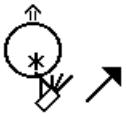
In this section LSM agreement verbs are analysed and sorted according to whether they are anchor-initial, anchor-final (backwards) or free agreement verbs. In this section it can be noted that for all examples the verbs are not marked for pronominal points in space.

7.7.1 Anchor-Initial

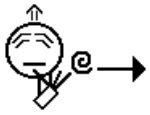
In anchor-initial verbs the handshape glyph is written at the initial location glyph.

7.7.1.1 SAQSA (ASK)

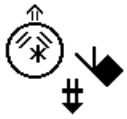
(320)  SAQSA (ASK) (Luqa3v10)

(321)  SAQSA (ASK) (Luqa3v14)

(322)  SAQSA (ASK) (Mattew2v1)

(323)  SAQSA (ASK) (Peter 17)

7.7.1.2 RA (SEE)

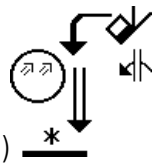
(324)  RA (LOOK) (Luqa1v36)

(325)  RA (LOOK) (Luqa21v25)

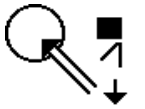
(326)  RA (LOOK) (Barnuza 31)

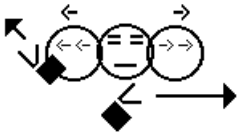
(327) RA-ISFEL (LOOK-DOWN) (Zarbun 05)

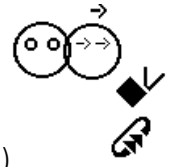
(328) RA (LOOK) (Nokk 05). The verb RA (LOOK/SEE) can be categorized as body-related verbs.

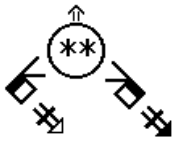


(329) RA-NI (SEE-ME) (Manif 03)

(330)  ĦARES (LOOK) (Salve 04)

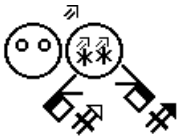
(331)  RA HEMM HEMM (SEE THERE THERE) (Luqa2v34)

(332)  RA (SEE) (Luqa2v34)

(333)  RA (SEE) (Luqa2v12)

(334)  RA (SEE) (Luqa23v18)

(335)  RA (SEE) (Luqa15v23-24)

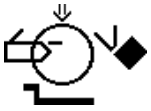
(336)  RA (SEE) (Luqa2v9)

(337)  RA (SEE) (Mattew2v2)

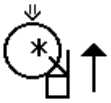
(338)  RA (SEE) (Nokk 18)

(339)  RA (SEE) (Peter 12)

In (340) since part of the lexical sign is the raised shoulder glyph, if this verb needs to be inflected to a pronominal point, the tense glyph marking the pronominal point can be incorporated into the same shoulder glyph, rather than writing another one.

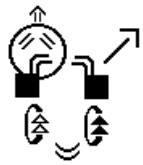
(340)  SSPJUNA (SPY) (Peter 29)

(341)  RA-NI (SEE-ME) (Luqa1v43)

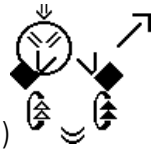
(342)  RA (SEE) (Luqa2v17)

(343)  ⊬ARES (LOOK) (Nokk 18)

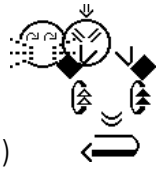
7.7.1.3 FITTEX (SEARCH)



(344) FITTEX (SEEK) (Mattew2v2)



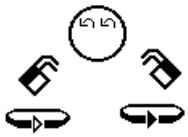
(345) FITTEX (SEEK) (Luqa15v4)



(346) FITTEX (SEEK) (Luqa15v4)

(347) FITTEX (SEEK) (Mattew2v13)

(348) FITTEX (SEEK) (Luqa15v8)



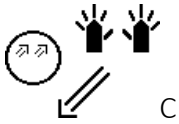
(349) FITTEX KULLIMKIEN (SEARCH ALL AROUND) (Nokk 16)

(350) FITTEX (SEARCH) (Peter 10)

7.7.1.4 QAL (SAY)

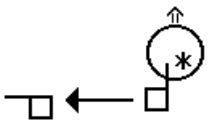
(351)  QAL (SAY) (Luqa1v36)

(352)  QAL (SAY) (Luqa1v38)

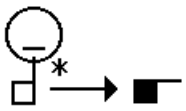
In the Manifikat found in the LMAP there is the beginning of the use of the shoulder glyph and contact glyph to mark 1st person singular. 1st person singular pronoun is written as:  (Manif 03) and QAL-I (TELL-ME) (353) uses the shoulder glyph and contact glyph. However it is not used for every instance of pronominal reference marking. The shoulder glyph was not used to mark 3rd person plural, as can be seen in  CL-ĦNIENA-FUQHOM (CL-MERCY-THEM) (Manif 04) nor the spelling for KEĊĊI-HOM (BANISH-THEM) (Manif 04) (365).

(353)  QAL-LILI (TELL-ME) (Manif 03)

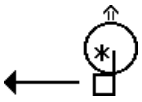
(354)  QAL (SAY) (Luqa21v25)

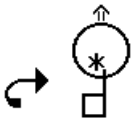
(355)  QAL (SAY) (Luqa10v27)

Attempts to show the modification of verbs moving towards pronominal points can be seen in this section. However they cannot be read as there is no regular way of writing these. The pronominal points are simply not marked in the written forms. A SW 'glyph' key is proposed in Section 10.5 and a sentence that includes these signs (Barnuza 27) is rewritten in Appendix H.

(356)  QAL-U/EK (SAY-YOU/HIM) (Barnuza 27)

(357)  QAL-JIEN (TELL-ME) (Mattew2v4)

(358)  QAL-HU/HA (TELL-HIM/HER) (Peter 35)

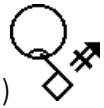
(359)  QAL (TELL) (Luqa15v22)

(360)  QAL (SAY) (Luqa3v11)

In (361), (362) the SW form QAL (SAY) is used to mark the beginning of direct discourse. Not inflected here, the movement is part of the citation form of QAL (SAY).

(361)  QAL (SAY) (Gakki 4)

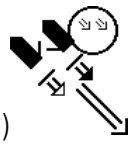
(362)  QAL (SAY) (Peter 17)

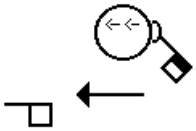
(363)  QAL (SAY) (Mass 03 04)

7.7.1.5 OTHERS

(364) can be inflected to the left, right and centre. The handshape glyphs here could be rotated fully to point towards left and right, just like the index handshape for pronominal points (see Section 10.4).

(364)  ADURA (ADORE) (Mattew2v2)

(365)  KEĊĊI (BANISH) (Manif 04)

(366)  SEMA' (HEAR) (Barnuza 27)

(367)  JAF (KNOW) (Mattew2v4)

(368)  KIEN JAF (KNOW) (Pass 02; 03; 05; 07; 08)

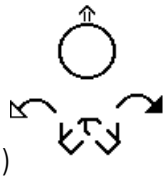
(369) SAB (FOUND) (Luqa15v23-24)

(370) SAB (FOUND) (Luqa15v4)

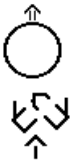
7.7.2 Free Verbs

Free Verbs are a subset of Agreement Verbs, however they may have both subject and object affixes. This is so because for these verbs the hand/s is/are not anchored to the body and thus the hand/s is/are free to be positioned at any point for the initial part of the sign and may travel and end at any point in the signing space. Free verbs are neither initial-anchored nor final-anchored agreement verbs.

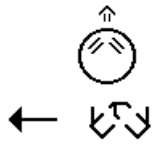
7.7.2.1 TA (GIVE)

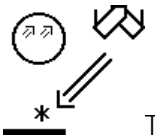


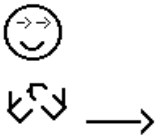
(371) TA LIL KULĦADD (GIVE ALL) (Luqa2v11)



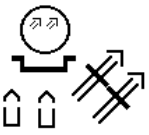
(372) TA (GIVE) (Luqa2v21)

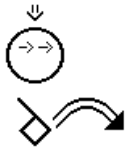
(373)  TA (GIVE) (Luqa15v16)

(374)  TA-NI (GIVE-ME) (Manif 03)

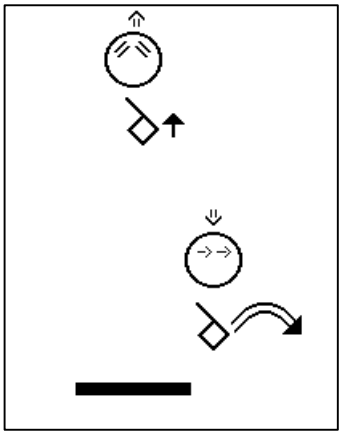
(375)  TA (GIVE) (Barnuza 2)

(376)  TA (GIVE) (Gakki 4). Intended pronominal 2nd person singular

(377)  TA-ALLA (GIVE-GOD) (Luqa2v23)

(378)  TA-WIEĦED (GIVE-ONE) (Luqa3v11)

In (379) the Indirect object is unclear. The intended object is 3rd person-right. In this written form, how can you tell this is not a classifier verb (CL-PERSUNA move)? In this case the vertical column was used to help clarify. However the result was still not clearly read. It is argued here that the recommendations of this work 9#Chapter 10will help create a less ambiguous text:

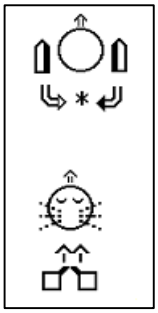
(379)  WIEĦED TA (ONE GIVE) (Luqa3v11)

(380)  FLUS-TA (MONEY-GIVE) here the intended sign was ‘give you sg, 2nd person singular’.

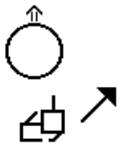
(381)  BASKETT-TA (BAG-GIVE) (Barnuza 7)

(382)  PAĊI-IRĊIEVA (PEACE RECEIVE) (Luqa1v14)

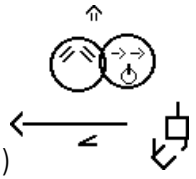
(383) was read ‘peace give’ not ‘peace-receive’ as was intended. The direction of arrows appear to change the meaning. Here the pronominal points could be used (see Section 10.5).

(383)  PAĊI-TA (GIVE PEACE) (Luqa1v45)

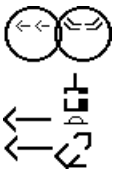
7.7.2.2 GĦEN (HELP)



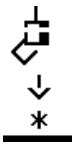
(384) GĦEN (HELP) (Peter 18)



(385) GĦEN (HELP) (Peter 32)

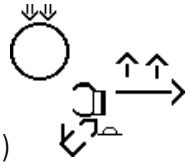


(386) GĦEN (HELP) (Luqa15v29)



(387) GĦEN-I (HELP-ME) (Salve 04)

(388) GĦEN (HELP) (Luqa15v12)

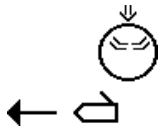
(389)  GĦEN (HELP) (Luqa15v12)

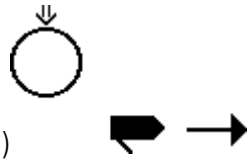
(390)  GĦEN (HELP) (Luqa15v12)

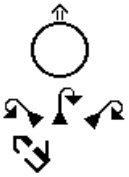
7.7.2.3 DAĦAL (ENTER)

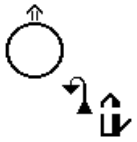
(391)  DAĦAL (ENTER) (Luqa2v1)

(392)  DAĦAL (ENTER) (Gakki 8)

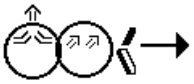
(393)  DAĦAL (ENTER) (Luqa15v28)

(394)  ĦAREĠ (EXIT) (Luqa15v28)

(395)  MAR-MAR-MAR (GO-GO-GO) (Luqa2v3)

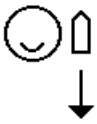
(396)  DAĦAL (ENTER) (Luqa1v40)

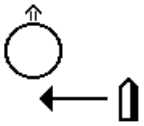
(397)  DAĦAL (ENTER) (Nokk 06)

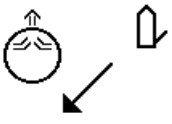
(398)  WARRAB (SET ASIDE) (Luqa15v18)

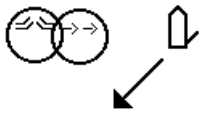
7.7.3 Anchor-Final / Backward Verbs

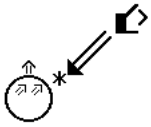
Is there such a thing as backward verbs, or is it just the modification of the direction of movement that produce such verbs? (399) is the opposite of QAGĦAD (STAY)  . The verb in (399) is a mirror of the verb QAGĦAD (STAY) with an opposite direction of the arrow glyph and orientation of handshape glyph.

(399)  ĠIE (COME) (Luqa1v43)

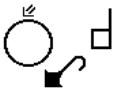
(400)  ĠIE (COME) (Mattew2v1)

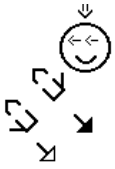
(401)  ĠIE (COME) (Gakki 8)

(402)  ĠIE (COME) (Gakki 9)

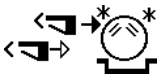
(403)  FEHEM (UNDERSTAND) (Luqa21v25)

(404)  XTARA (BUY) (Gakki 3) This was in the sentence: BUY COW THAT-ONE

(405)  ĠIE LURA (RETURN) (Nokk 12)

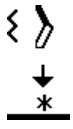
(406)  STIEDEN (WELCOME) (Peter 03)

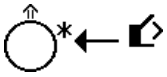
(407)  EJJA (COME) (Peter 12)

(408)  TGĦALLEM (Luqa15v1)

(409)  EJJEW (COME) (Luqa15v6)

(410)  EJJEW (COME) (Mattew2v8)

(411)  EJJA (COME) (Salve 04)

(412)  FEHEM (UNDERSTAND) (Mattew2v9)

7.7.4 Agreement verbs in written form: Synthesis

It can be concluded here that there is no regular pattern for writing agreement verbs. In (329) (353)(387) (390) (409) and (411) the beginning of using a shoulder glyph to mark first person can be seen. The lack of a consistent pattern to mark pronominal referential points caused some reading difficulties with the texts, where precise intended meanings were not read. On the basis of this analysis the work on pronominal referential points in writing was carried out and is presented in Chapter 10.

7.8 SEMANTICALLY BODY-RELATED VERBS

Many LSM verbs described in Sections 7.5, 7.6 and 7.7 may be further modified to include body-related meanings. These verbs consist of movement and contact towards or away from a body-location, by means of which a semantic link to that body part is created, e.g. XOROB (DRINK) is bound to the mouth location and LSM OPERA (OPERATE) bound to the chest location.

7.8.1 Chest-located verbs

(413)  GĦANNAQ (HUG) (Luqa1v40)

(414)  ĠISEM IMTELA' (BODY FILL) (Luqa1v41)

(415) could also mean 'slice chest area'. This indicates that a glyph marking stomach area is necessary to disambiguate between ĊESARJA (CESEAREAN) and a chest operation.

(415)  QASAM IŻ-ŻAQQ (SLICE TUMMY) (Barnuza 32)

7.8.2 Mouth-located verbs

(416)  TKELLEM (SPEAK) (Luqa1v41)

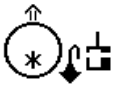
(417)  TKELLEM (SPEAK) (Luqa1v44)

(418)  KIEL (EAT) (Luqa15v16)

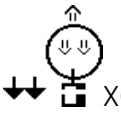
(419)  KIEL (EAT) (Gakki 8)

(420)  GERGER (COMPLAIN) (Nokk 11)

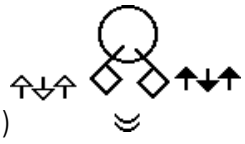
(421)  XOROB (DRINK) (Luqa1v15)

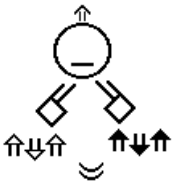
(422)  XOROB (DRINK) (Luqa1v15)

(423)  KIEL (EAT) (Luqa21v34)

(424)  XOROB (DRINK) (Luqa21v34)

(425)  DAĦAK (LAUGH) (Nokk 20)

(426)  TKELLEM (TO SPEAK) (Mass 03 06)

(427)  KIEL (EAT) (Luqa15v23-24) This can also be categorized as a HANDLE classifier


(428) XOROB (DRINK) (Liturgija 2)

7.8.3 Hand-located verbs

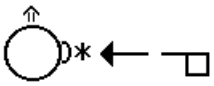
There is only one hand-located sign that has been found in the LSM texts. The sign for ĠESU (JESUS) resembles the verb shown in (429).

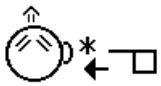

(429) KKRUĊIFISSA (CRUCIFY) (Kredu 11) add Gesu

7.8.4 Ear-located Verbs


(430) SEMA’ (HEAR) (Luqa1v44)

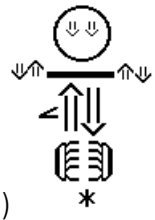

(431) SEMA’ (HEAR) (Luqa15v25)

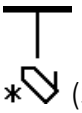
(432a)  ĦOSS DAĦAL FIL-WIDNA (SOUND ENTER EAR) (Luqa1v41)

and (432b)  (Luqa1v44).

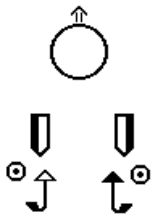
7.8.5 Stomach-located verbs

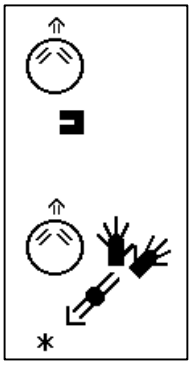
There are verbs that are related to the stomach/womb area in LSM. These are written using the shoulder glyph and the handshape glyphs are written well below the shoulder glyph.

(433)  QABEŻ FIL-ĠUF (JUMP IN WOMB) (Luqa1v41)

In (434) it is not clear whether the stomach area or the chest area is involved (see also 415). In Salve 04 the following glyph was used to indicate the stomach area and make the sign 'WOMB' clearer  (Salve 04). In the LSM dictionary the use of a similar glyph to mark stomach area was used for the writing of the LSM sign UNGERIJA (HUNGARY) (Azzopardi-Alexander, 2004 p. 167). It is thus recommended to use this SW glyph for the writing of the stomach area in LSM.

(434)  ĠUĦ (STONKU JGERGER) (HUNGRY; STOMACH RUMBLING) (Nokk 07).

(435)  TWIELED (BORN) (Luqa2v11)

(436)  ‘E’ SPIRTU SANTU JINŻEL ĠUF (‘E’ HOLY SPIRIT MOVE-DOWN TO WOMB) (Luqa1v41)

7.8.6 Head-located verbs

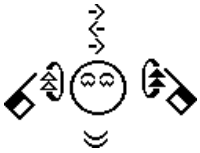
Verbs that are located at the head/mind/brain area and that were found in the LSM texts are listed here. These are related semantically to the head/brain/mind and thus the upper part of the head glyph is used.

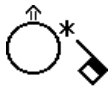
(437)  INDUNA (NOTICE) (Mass 03 01)

(438)  IDEA (IDEA) (Mattew2v3)

(439)  ĦASEB (TO THINK) (Mass 03 06)

(440)  ĦASEB (TO THINK) (Luqa1v20)

(441)  STORDA (DIZZY) (Barnuza 32)



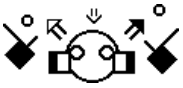
(442)  EMMEN (BELIEVE) (Kredu 01)

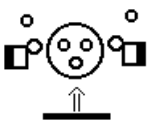
7.8.7 Eye-located verbs

LSM verbs that are related to the eyes are signed in the area of the eye on the head glyph. Sometimes the eye glyphs are included and other times not. For GĦALAQ GĦAJNEJH (CLOSE EYES) (447) the closed eyes glyph is included. In one spelling of QAM (WAKE UP) the open eyes glyph is included.

In (443) (445) and (446) the handshape glyph written is the initial position and then the open finger glyphs  are added to represent the opening of the hands. However in (444) the end position of the hands is also written. The recommendation made in this work is that the initial position of the hands is written using SW (see Section 10.8.4).

(443)  QAM (WAKE-UP) (Mattew2v20)

(444)  QAM (WAKE-UP) (Mattew2v13)



(445) QAM (WAKE-UP) (Nokk 18)

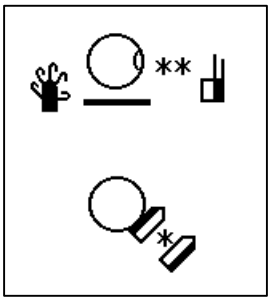
(446)  QAM (WAKE-UP) (Mattew2v14)

(447) GĦALAQ-GĦAJNEJN (CLOSE-EYES) (Nokk 12)

(448)  BEKA (CRY) (Nokk 13)

(449) BEKA ĦAFNA (CRY INTENSELY) (Nokk 15)

In (450b) PAPA-ORS (DADDY-BEAR) precedes the possessive noun SODDA (BED). This contrasts with (450a) where the facial expressions and closed eyes mark it as verbal. In the LSM written data seems to be an emerging pattern that for noun-verb pairs a noun is marked by lack of facial expressions, whereas a verb includes facial expressions.

(450a)  RAQAD (SLEEP) (Nokk 11) and (450b)  PAPA-ORS SODDA (DADDY-BEAR BED) (Nokk 11)

Another example can be seen in (451) that contrasts with (452) and (453). When the name Barnuża-Ħamra (Red Riding Hood) is used no facial expressions are added to the head glyph. However, when she was putting on her bonnet and tying it the head

glyph also included a smile glyph. It is possible that the smile glyph helps mark an LSM verb in written form. In Section 8.8.2, the inclusion of the smile glyph is discussed at further length.

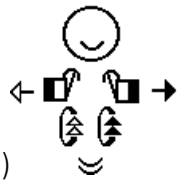
Although it cannot be concluded on the basis of this observation, a future study could be carried out to investigate whether there is a relationship between facial expressions, marked by the smile glyph in the LSM texts, and the difference between verbs and nouns in LSM and other sign languages.

7.8.8 Verbs that mimic dressing up

(451)  LIBES-BARNUŻA (PUT ON HOOD) (Barnuza 3)

(452) LIBES-BARNUŻA (PUT ON HOOD) (Barnuza 4)

(453) occurs at neck area to bring about the meaning QAFEL-BARNUŻA (TIE-HOOD). In (248) the same spelling without the head glyph is found and there there the meaning is to tie something.



(453) QAFEL-BARNUŻA (TIE-HOOD) (Barnuza 4)

On the basis of this data, it is recommended that when a sign carries body-related meanings, the body location glyph should be included in the spelling.

7.9 VERBS THAT INCLUDE FACIAL GLYPHS MARKING EMOTION

Some facial expressions that mark emotion have been found in the LSM data. The most common facial expressions marking emotions found were:

 HAPPINESS

 SADNESS

 ANGER

 CONCERN / WORRY

 FURIOUS /EVIL

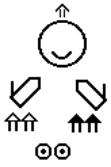
A furious eyebrow glyph can be found in (454). However in (456) a happy facial expression accompanies the same manual sign, since in this case it is direct discourse and the wolf in the story is trying to be sweet to Red Riding Hood. (455) uses a frown glyph to mark anger. (457) does not use a facial expression glyph. As discussed in Section 7.8.7, the addition of facial expression glyphs may mark verbs thus (457) may well be a noun rather than a verb. Should nouns of emotion, e.g. anger, happiness etc. exclude the facial expression glyphs?

(454)  RRABJA (TO BE ANGRY) (Luqa15v28)

(455)  RRABJA (TO BE ANGRY) (Peter 22)

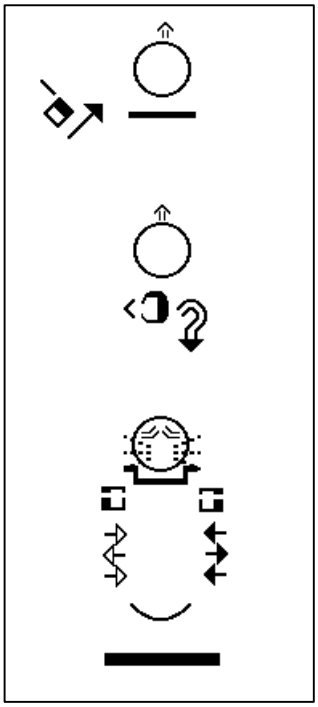
(456)  RRABJA (TO BE ANGRY) (Barnuza 17)

(457)  RRABJA (TO BE ANGRY) (Barnuza 30)

(458)  FERAꟾ (HAPPY) (Luqa1v14)

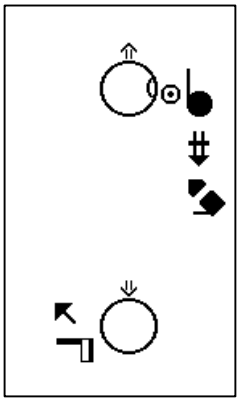
The facial glyphs are sometimes useful to disambiguate between similar sign spellings. (459) is a pointing sign and the facial markers help distinguish this from a multitude of other possibilities (see Section 6.5 and 6.6). Also (458) is very similar to the verb XTAQ (WISH) and the smile may help to disambiguate between the two signs.

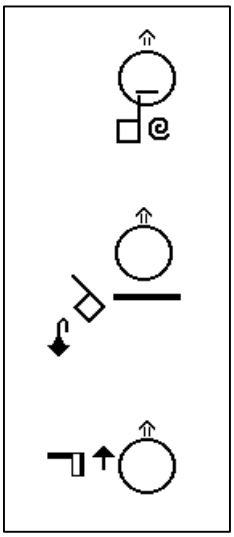
(459)  WISSA (WARN) (Barnuza 33)

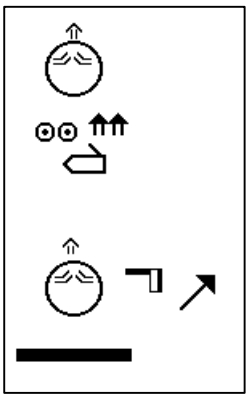
(460)  (Luqa2v9) HUMA RGĦAJJA BEŻGĦU (THEY SHEPHERDS FEAR/AFRAID).

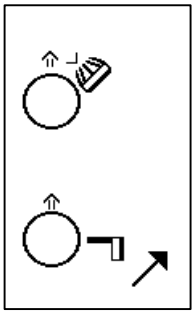
7.10 VERB DAR (HOME): NOUN TO VERB

The LSM sign DAR (HOME/HOUSE) appears to be in a state of change. In the LSM dictionary (Azzopardi-Alexander, 2004, p. 35) it is described as the bent-5 hand being placed at head-level or slightly below. However there are various spellings of the sign DAR (HOME/HOUSE) in the LMAP that suggest that this sign is being modified to include forward movement to different locations in the signing space. In (461) the sequence is TIFLA-DAR (GIRL-HOME). In (462) the sequence is BARNUZA-LURA-D-DAR (RIDING-HOOD-BACK-HOME). This may be the beginning of this LSM anchored-sign being modified to become a verb. In the story it means 'take the girl home'. Thus the LSM sign DAR (HOME, HOUSE) may be developing into a verb meaning MAR-DAR (GO-HOME).

(461)  TIFLA DAR (GIRL HOUSE) (Peter 18) and

(462)  AĦMAR LURA DAR (RED BACK HOUSE) (Barnuza 30)

(463)  XTAQ DAR (WISH HOUSE) (Peter 27)

(464)  L-GHORRIEF DAR (WISE-MEN HOUSE) (Mattew2v12)

7.11 CONCLUSION

In this chapter an analysis of the LSM verbs in the LMAP was carried out. Section 7.5-7.7 analysed the different SW verbs found in the LSM texts into plain, WE classifiers and agreement verbs. In Section 7.8 LSM SW verbs that included body-related meanings were analysed and in Section 7.9 LSM SW verbs that included facial expression glyphs were investigated briefly.

CHAPTER 8: THE LSM GLYPH-SET

8.1 INTRODUCTION

This chapter presents an analysis of the SignPuddle 2.0 and the largest literature puddles it contains, as well as an analysis of the LSM glyph-set. In the first section SignPuddle 2.0 is described and analysed in order to obtain some statistical evidence of its global use (Section 8.2). The reason for doing so is to place the Literature Malta Archive Puddle (LMAP) within its wider context of the SignPuddle 2.0 where there are several other literature Puddles of different sign languages. A tentative comparative analysis of the ten largest literature Puddles is then carried out (Section 8.4).

In the sections that follow an account is given of the LSM glyph set found in the LMAP (Section 8.5). In Sections 8.6-8.8 LSM spellings that differ in glyphs are analysed and the results of the reading-questionnaire (Section 5.5) are presented indicating the preferred glyphs of the Deaf participants. Finally in Section 8.9 a discussion is held on glyphs, alloglyphs and a possible grapheme-set for LSM.

8.2 SIGNPUDDLE 2.0

SignPuddle 2.0 is an online software program created by Steve Slevinski at http://www.signbank.org/signpuddle/ its current home. There is a list of 81 SignPuddles (henceforth 'Puddles') (see Figure 8.1) of different sign languages that can be used to write and edit SW documents directly on the internet.

Figure 8. 1: The 81 Puddles taken from http://www.signbank.org/signpuddle/

There are public and private Puddles. Public Puddles are open to anyone to write SW, whereas private ones are not. In Figure 8.1 each icon represents a different Puddle. On the final row of this diagram the icons marked with the numbers 1-9 are the private Puddles. Both private and public Puddles have an editor or a group of editors who can moderate and edit what enters the Puddle. There are also 'personal' Puddles that are stored on a USB stick and that do not require internet connection. Naturally these are not listed on the homepage.

Each Puddle listed on the homepage contains a dictionary and literature Puddle. The dictionary Puddle is intended for single-sign entries and the literature Puddle for text entries (utterances/sentences). It is up the discretion of the writers, and ultimately the editors, how to organize the dictionary and literature Puddles. There are instances where single-sign entries have been inputted into the literature Puddle. In

the Catalonian literature Puddle[39] there are 17 entries and 23 individual signs, indicating that it has not yet been used for text entries. Also the French literature Puddle[40] consists of ten entries that are single signs.

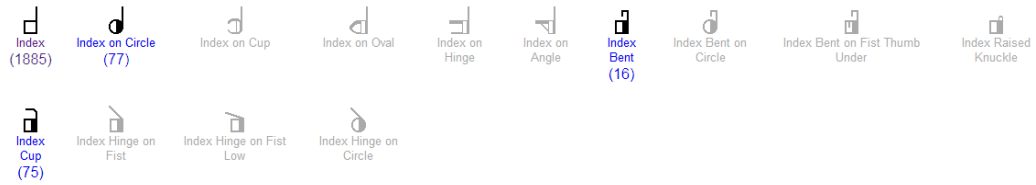
8.2.1 Symbol Frequency Tool

SignPuddle has an inbuilt tool that allows the user to check for the number of times each glyph was used in the Puddle. Symbol Frequency does not carry out glyph calculations across a Puddle. Such calculations and conclusions need to be worked out by the researcher. Additionally cross comparisons are not worked out by this tool, but need to be carried out by the researcher.

The Symbol Frequency tool first directs the user to five categories of SW: Hands, Movements, Head/Face, and Body. Once the category is selected, the glyph representing the SW Group (see Appendix B) is selected and then a list of the glyphs within that group appear. The highlighted glyphs are the ones used in the Puddle and the number underneath that glyph is the number of times that glyph is used in the Puddle (see Figure 8.2). Each glyph representing the SW group needs to be analysed individually. All BaseSymbol glyphs used in the LMAP for the writing of LSM have been placed together in Appendix B. The light shaded symbols indicate the glyphs not used and the dark symbols indicate the symbols used with their frequency counts (see Figure 8.2).

[39] http://www.signbank.org/signpuddle2.0/latest.php?total=199 analysed 29/08/2012
[40] http://www.signbank.org/signpuddle2.0/index.php?ui=1&sgn=124 analysed 03/09/2012

Figure 8. 2: Part of a screen-shot of the LMAP Archive Puddle for the index finger BaseSymbols (dark shaded are the glyphs used, light shaded have not been used)



The Symbol Frequency does not count glyphs of two SW categories, the Punctuation group and the Detailed Location group (Section 2.7). Thus when the total amount of glyphs for Puddles are compared to the number of ISWA BaseSymbol Glyphs the total of 632 (and not 652) is used, since the number of Punctuation and Detailed glyphs are taken away from the grand total in order to make the comparison possible.

The information regarding the different Puddles has never been carried out, however Channon and Butler (2010) have used the different Puddles available together with the SignTyp database to investigate the most highly frequent handshapes across different sign languages.

8.2.2 SignPuddle 2.0: Not a controlled linguistic database

SignPuddle 2.0 has been criticised for its lack of scientific rigidity (Schembri, Adam; Parvaz, Dan, SSLING-L archives, July 2012). Each Puddle is not necessarily a linguistic database maintained by linguists and is not designed to tag corpora[41]. The words

[41] SignPuddle 3.0 is expected to be released in 2014 and may be able to do so.

'dictionary' and 'literature' may be misleading in implying that these are edited and final dictionaries and literature databases. Schembri (SLLING-L email July 2012) criticised the status of the public German dictionary Puddle[42] as a 'dictionary', since the entries are not all separate lexemes. He noted modifications of a sign are listed as entries, unlike the traditional framework of a dictionary.

Rather than linguistic databases, Puddles are collections of writings, used by Deaf people, students, teachers, and other professionals. SignPuddle 2.0 is a SW editing program that stores entries inputted, irrespective of the standards applied to the process of editing and storing SW. It does not place restrictions on double-entries or other inconsistencies. It is up to the user to set any rules and standards for inputting data. In the LMAP the researcher was the editor, thus the standard of no identical entries was applied.

Unlike all other notation system for sign languages, SW is used for 'writing' as defined in Section 3.2.1. Data in the Puddles provides evidence for this, since here SW is used by all, rather than exclusively by sign linguists. SignPuddle 2.0 in itself is a unique and rich resource that deserves investigation in its own right. It has the potential of providing insights into the development of writing systems for different sign languages.

8.2.3 Is SignPuddle 2.0 used?

Some statistical information was recorded in 2012 and then later in 2014. This was useful to see the growth of the Puddle over almost a year and a half. Although there

[42] http://www.signbank.org/signpuddle2.0/index.php?ui=8&sgn=53

were 90 Puddles available at the dates of analysis, a few were not used. The statistical Puddles were gathered on 01/09/2012 and a year and four months later on 10/01/2014. Each Puddle may increase with time. In Appendix D the data from the Puddles is presented.

From the analysis of the information collected about the Puddle in 2012 and 2014 it can be concluded that many dictionary Puddles are being used. There are fewer literature Puddles that are being used.

In 2012, seventy-five Puddles were used and fifteen were empty. In 2014 eighty were used and ten were empty. This shows an increase of five Puddles in just one year four months (Appendix D).

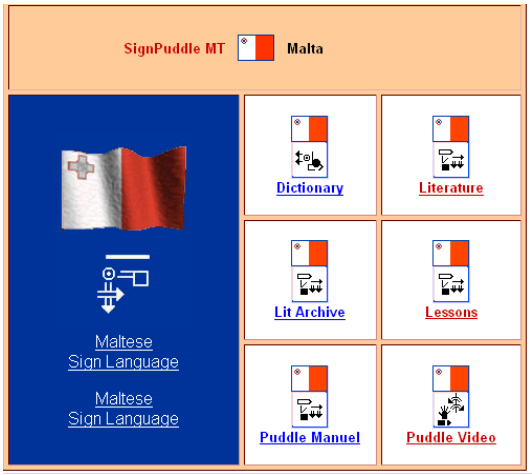
Forty-one Puddles showed an increase in their amount of entries from 2012 to 2014. This proves that these forty-one Puddles are being used. There are Puddles that have increased by only a few entries (1-30) and other Puddles that have increased by hundreds and even thousands. The Puddles increased most during this time were those of the Czech Republic, Tunisia, Germany, Slovenia, Paraguay, Canada Quebec and the ASL Bible Puddles.

8.3 THE MALTA SIGNPUDDLE

On the SignPuddle homepage http://www.signbank.org/signpuddle/ there is an icon of the Malta flag and selecting this opens the Malta SignPuddle (see icon MT). Here there are three public Malta Puddles: the dictionary, the literature and the literature Malta archived Puddle (the LMAP). In Figure 8.3, there are three other icons with

Maltese flags listed as ‘Lesson’, ‘Puddle Manuel’ and ‘Puddle Video’. When clicking these icons the user is redirected to the web pages that deal with lessons in SW http://www.SW.orlesosng/lessons , a pdf file with instructions on how to use SignPuddle http://www.SW.org/archive/docs5/sw0485-US-SignPuddle15Manual.pdf and video instructions on how to use SignPuddle at http://www.signbank.org/signpuddle/help/SignPuddle15VideoUS/

Figure 8. 3: Screenshot of part of the webpage that directs the user to the different Malta Puddles



The Malta dictionary Puddle consisted of 748 entries on 01/09/2012 and 769 entries on 10/01/2014. The Malta literature Puddle consisted of 557 entries which amount to 5,468 individual signs when first counted on 01/09/2012. When counted a year and four months later (10/01/2014) the amount was 668, amounting to 6,252 individual signs.

In order to carry out the analysis of the LSM glyph-set, the Malta literature Puddle was copied and archived and named the ‘Literature Malta Archived Puddle’

(henceforth LMAP). Slevinksi (Section 8.2) created the copy on 10/07/2012. The LMAP thus consists of the amount of entries that were available in the Malta Literature Puddle on that date, which was 557 entries and 5,468 individual signs. The LMAP is used as data in this work.

8.4 LITERATURE PUDDLES

The ten literature Puddles that had the highest entries in 2012 were analysed in order to place the LMAP in a context of other literature Puddles. The Puddles listed in Table 8.1 are the ten largest literature Puddles available. Seven of these ten Puddles, increased in size over one year and four months. This indicates that they are active Puddles. The ASL Bible Puddle is undoubtedly the most highly active Puddle with an increase of 34,774 signs in less than a year and half. The Tunisia and the Czech literature Puddles follow with an increase of 2,097 signs and 1,036 signs.

Table 8. 1: The Active Literature Puddles with their corresponding number of text entries and number of individual signs (in brackets)

Literature Puddles	No of Entries (No. of Signs) 2012	No of Entries (No. of Signs) 2014	Change in number of signs
ASL Bible[43]	13,110 (120,587)	15,944 (155,361)	34,774
Brazil	132 (3,401)	143 (3,495)	91
Czech Republic	15 (933)	28 (1,969)	1,036
Germany	396 (4,935)	412 (5,193)	258
Malta	557 (5,468)	582 (5,677)	209
Nicaragua	454 (10,841)	454 (10,841)	0
Norway	343 (2,283)	342 (2,262)	-21

[43] The ASL Puddle became so large that it was divided into two ASL Puddles (SW List email dated 19/06/2013). For the results in the no. of signs for 2014 the two ASL Bible Puddle were added. (8,032 + 7,912 = and 8,599 +146,762 = 155,361)

Spain	454 (13,754)	455 (13,755)	1
Tunisia	34 (1,295)	115 (3,392)	2,097
United States	624 (10,775)	682 (11,662)	887

8.4.1 Comparing the Glyph-Sets

The comparative study carried out here took place in 2012, therefore the number of glyphs per Puddle are based on the texts found in the Puddles in 2012, precisely on 01/09/2012. The BaseSymbol glyph-sets of these ten largest literature Puddles are available in Appendix E, Tables E4-E6. The number of BaseSymbol glyphs used in each of these Puddles was counted and in Table 8.2 the number of BaseSymbol glyphs per Puddle is shown.

Table 8. 2 High-entry literature Puddles with the corresponding number of BaseSymbols glyphs

	BaseSymbol glyphs[44] (excluding Detailed Loc and Punctuation)
ISWA 2010	639
ASL Bible	445
Brazil	246
Czech	199
Germany	312
Malta	*266*
Nicaragua	291
Norway	246
Spain	305
Tunisia / TN	244
US	418

[44] The SW categories of Location and Punctuation (Section 2.7.1) are not worked out by the Symbol Frequency and were left out, the ISWA total shown here is the total of glyphs excluding these categories.

8.4.2 SignPuddle 2.0: A methodological shortcoming

One of the shortcomings of SignPuddle 2.0 is that it does not contain information concerning a number of variables. There is limited information available about the writers of each Puddle. The number of writers in a Puddle is not known, nor their age, gender, whether they are Deaf or hearing, and their level of skill[45] in SW. These details are unknown unless it is a controlled Puddle (such as the LMAP and the ASL Bible Puddle) and thus information about the writers is recorded separately and updated regularly. SignPuddle 2.0 stores IP addresses, however an IP address does not necessarily count as one writer, since one writer can use more than one IP address.

Despite this lack in including the variability of writers and their level of skill, the analysis drawn from SignPuddle 2.0 is still considered to be valuable, due to the high number of entries of these ten literature Puddles. Some degree of skill in SW is without doubt required to have created these literature Puddles. If the variables of the writers were available, more conclusions might have been possible. At this stage the conclusions drawn from the Puddles are few (Section 8.4.4), but the list of questions prompted by the glyph-set (Section 8.4.3) are evidence that SW can also be valuable as they may become future research questions to be answered.

[45] SignPuddle 3.0 is in progress during the writing of this work and when released it intends to contain several more features to make it more 'researchable'. One of these features includes tagging of the data.

8.4.3 Questions prompted by the glyph-sets of the literature Puddles

From the literature Puddles' glyph-sets only two main conclusions can be drawn (Section 8.4.4) due to lack of information about variables related to the writers. However the analysis points to the usefulness of SW and the Puddles for future linguistic research.

Several questions arise from the information in Table 8.2. The two ASL Puddles have the largest glyph-sets that are similar in number with 445 and 418 glyphs (see Appendix E). This similarity between glyph-sets has been found, despite the fact that the ASL Bible has only two writers, and the US Puddle has several writers. Is this high number of glyphs language-specific and does it reflect ASL phonology in any way? Is there a correlation between the number of writers and the size of the glyph-set? Or perhaps there is a relation between the amount of entries in each Puddle and the size of each glyph-set? These questions cannot be answered here but may be answered in future research.

The remaining literature Puddles all use fewer than 312 BaseSymbol glyphs. The Norway and Brazil literature Puddles have the same amount of BaseSymbols glyphs: 246. The Tunisia literature Puddle comes extremely close to this total with 244 BaseSymbol glyphs. The LMAP is also close to this figure, with 266 glyphs. This means that four out of the ten literature Puddles are very close in the number of glyphs used to write the different sign languages.

The ten literature SignPuddles could be divided into three different categories (see Figure 8.4), on the basis of the number of BaseSymbol glyphs used. Other

observations can be made such that LSM, Norway and Czech Republic use no glyph from Group 7 of ISWA 2010 (see Appendix E. Table E5). These three languages also happen to be categorized together on the basis of their number of glyphs.

Figure 8. 4: Three categories of literature Puddles on the basis of the number of BaseSymbol glyphs used

Category 1:	418-445 Glyphs – ASL Bible and US Literature
Category2:	291-312 Glyphs – Spain, Nicaragua and Germany
Category 3:	199-266 Glyphs - Malta, Norway, Brazil, Tunisia and Czech Republic

A number of questions arise: 1) Are these four Puddles related to each other on any other linguistic levels? 2) Is there no relationship whatsoever between the number of glyphs and the different sign languages? 3) Is this coincidence or does the glyph-set indicate relationships between sign languages? These are, once again, questions that cannot be answered here, but could form future research questions.

8.4.4 Conclusions from the glyph-sets

Two main conclusions can be drawn here. Every Puddle uses a glyph-set that is smaller than the ISWA 2010 glyph-set (see Table 8.3). This validates the general assumption that no sign language requires all the BaseSymbol glyphs of the ISWA 2010.

The second conclusion is that the ten literature Puddles are evidence that different choices are being made when using SW to write different sign languages. These different choices result in the evolution of a writing system into an orthography

(Section 3.2.2). With time and use different orthographies are evolving from one system, SW.

8.4.5 The main consideration from the glyph-sets

The main question for the thesis of work is whether any phonological considerations can be made on the basis of these glyph-sets? This is a question that can be answered by users and linguists of the sign languages. In Section 8.5, phonological considerations of the glyph-set of the LMAP are made.

8.5 THE LSM GLYPH-SET: PHONOLOGICAL CONSIDERATIONS

The following sections address overriding research questions i and ii (Section 4.11.2), repeated here for ease of reference:

i. Can the LSM glyph-set be described? Can it be compared to other SL glyph-sets?

ii. Can an LSM grapheme-set be derived from the glyph-set, in order to establish bi-uniqueness where a grapheme represents a phoneme of LSM?

8.5.1 The LSM Glyph-Set: How many glyphs?

In Appendix F the LSM BaseSymbols used for the writing of the LSM texts and analysed from the LMAP are presented. A summary of the number of BaseSymbol glyphs used in the LMAP, in comparison to the number of glyphs of the ISWA 2010 can be seen in Table 8.3.

Table 8. 3: Summary of the number of LSM glyphs per SW group from 1-30

Group	Base-Symbol Glyph	ISWA 2010	LSM (from LMAP)
1		14	4
2		16	6
3		38	6
4		8	3
5		58	23
6		30	6
7		22	0
8		19	2
9		40	18
10		16	2
11		17	15
12		20	12
13		43	20
14		16	10
15		35	21
16		30	18
17		17	0
18		30	7
19		14	11
20		20	10
21		8	6
22		11	5
23		32	18
24		17	5
25		30	17

26		20	7
27		9	6
28		9	5
29	Detail Loc	8	0
30	Punct.	5	2
	TOTAL	**652**	**265**

The ISWA 2010 contains 652 BaseSymbol glyphs to write any sign language (see Section 2.6). LSM uses 268, which means that 384 BaseSymbols have not been used for the writing of LSM in the LMAP.

The question that arises from the analysis of the glyph-set used in the LMAP is whether the LSM requires all these 268 glyphs to write the language. Analysis of the texts found that many LSM spellings in the LMAP differ in the choice of glyphs. Finding different spellings of a sign that differed in the choice of similar glyph-forms provided evidence that some of the glyph-forms were inter-changeable, and that the different glyph-forms could be described as alloglyphs in LSM. The term alloglyph as used here is taken from Crystal's (2011) definition of the stem 'allo-' as used in linguistics:

> A prefix used generally in linguistics to refer to any noticeable variation in the form of a linguistic unit which does not affect that unit's functional identity in the language. The formal variation noted is not linguistically distinctive, i.e. no change of meaning is involved. (p. 20)

Although the term 'alloglyph' is used here, the discussion regarding whether the variations are linguistically distinctive or not is presented in Section 8.10.3. The slight variations in form may not be entirely meaningless due to their visual nature. Despite the awareness that in SL minor glyph-shapes may not always be entirely meaningless the term is still used here.

In Puddles or collections of writings that contain several writers the higher frequency alloglyph could be adopted as the glyph to represent the different alloglyphs in the writing of a given language. In the LMAP the majority of the texts were written by one writer (Section 5.8), thus the higher frequency glyphs found would point to the preference of this one writer. To eliminate this bias, it was decided to discover the whether Deaf readers' also found the glyphs equally acceptable for the spellings. If not, their preferences between the alloglyphs used in the LSM spellings were marked (see Section 5.5 and Appendix C).

8.5.2 Variant glyph-forms used in LSM spellings: Are all necessary?

The researcher searched for spellings in the LMAP that were written with variant yet similar glyph-forms. The spellings of low frequency glyphs were examined in order to see whether the higher frequency glyphs similar in form could be used interchangeably. If so then this would imply that they are alloglyphs and possibly not all required for the writing of LSM (but see Section 8.10).

The variant glyph-forms investigated in this work were mainly for handshape and movement glyphs in the LMAP (Section 5.5). Further future research may extend to

study alloglyphs of other parameters of LSM, i.e. face and head, body, dynamics (see Chapter 2).

8.6 RESULTS: LSM HANDSHAPE ALLOGLYPHS

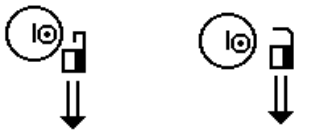
In the LMAP 70 handshape glyphs were used from 261 ISWA BaseSymbol handshape glyphs (see Appendix F). Here it is questioned whether all handshape glyphs are required. Spellings found using alloglyphs are presented in the following sections. The results of Exercise 1 of the reading-questionnaire (Appendix C) are also presented here. The higher frequency alloglyph found in the LMAP is also presented in the tables.

In Sections 8.6-8.8 the names of the handshape glyphs are adopted from the ISWA 2010 and are not described further. For a full list of the ISWA 2010 handshape glyphs reference can be made to Sutton's manual (2011). For basics of the ISWA 2010 please refer to Chapter 2 and Appendix B.

8.6.1 Group 1: Index Handshape

In Group 1 'Index Finger', the following two glyphs Index Cup  and Index Bent  are very close in form. The Index Cup represents a slightly more open bent index finger. Using either glyph does not result in a change of sign meaning in LSM and this may indicate that they are not phonemically distinctive in LSM.

In the LMAP the Index Cup glyph  has been used more frequently than the Index Bent  . The following spellings were identified in the LMAP, where the glyphs are used interchangeably:


O⊬T (SISTER)


⊬ASEB (THINK)

These signs were presented in numbers 1 and 2 of Exercise 1 of the reading-questionnaire (Appendix C). The results of the Deaf participants' preference can be seen in Table 8.4. The higher preference 75% is for the  Index-Cup glyph.

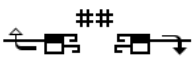
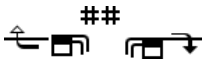
Table 8. 4: Participants' Preference for Group 1 glyphs

Name	Preference for  glyph	Preference for  glyph	Equally acceptable
Participant 1	2		
Participant 2	2		
Participant 3	2		
Participant 4	2		
Participant 5		2	
Participant 6	2		
Participant 7	2		
Participant 8	1	1	
Participant 9	1	1	
Participant 10	1		1
Total	(15)75%	(4)20%	(1) 5%
Higher Frequency in LMAP	*√*		

8.6.2 Group 2: Index Middle

The Index Middle Unit Cup  and the Index Middle Bent  appear to be alloglyphs in LSM. The Index Middle Unit Cup has been used more frequently in the LMAP than the Index Middle Bent 8. The following signs have been identified in the LMAP, where the glyphs are used interchangeably:

  ŻRINĠ (FROG)

  PROBLEMA (PROBLEMA)

These spellings were placed into the reading-questionnaire in Exercise 1, numbers 3 and 4 (Appendix C) for Deaf feedback. Table 8.5 shows that the glyph most highly preferred 45% is the  Index-Middle glyph. The glyph that was used more frequently in the LMAP was the Cup glyph  .

Table 8. 5: Deaf participants' preference for Group 2 glyphs

Name			Equally acceptable
Participant 1		2	
Participant 2		1	1
Participant 3	1		1
Participant 4	2		
Participant 5		1	1
Participant 6	2		
Participant 7		2	
Participant 8		1	1
Participant 9	1	1	
Participant 10	1	1	
	(7) 35%	(9)45%	(4)20%
Higher Frequency in Texts	*V*		

8.6.3 Group 3: Index Middle Thumb

The Index Middle Thumb Unit Hinge  is used more frequently than the Middle Thumb Angle  in the LMAP. The following spellings have been identified from the LMAP and have been included into Exercise 1, numbers 5 and 6 of the reading-questionnaire (Appendix C).

TABIB (DOCTOR)

MUNITA (COIN)

The highest preference is for the  glyph with 55% (Table 8.6). All instances of preferences for the  glyph were for the spelling of the sign TABIB (DOCTOR)  . Since this sign involves a grasp of the wrist, the fingers naturally open to take grasp of the wrist.

Table 8. 6: Deaf participants' preference for Group 3 glyphs

Name			Equally acceptable
Participant 1	1	1	
Participant 2	1		1
Participant 3	2		
Participant 4	1	1	
Participant 5			2
Participant 6	2		
Participant 7	1	1	

Participant 8	1	1	
Participant 9	1	1	
Participant 10	1		1
	11 55%	5% 25%	4% 20%
Higher Frequency in Texts	*√*		

8.6.4 Group 4: Four Fingers

There are only three glyphs used for the writing of LSM in this group:

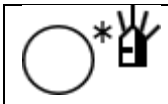
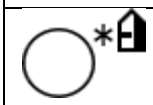
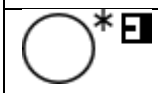

Four Fingers


Four Fingers Unit


Four Fingers Unit Bent

All three are minimally distinct (see Figure 8.5). On the basis of this it can be concluded that they are not alloglyphs but each a glyph (or rather a grapheme see Section 2.3.3) of the language.

Figure 8. 5: Minimal distinctions of different graphemes for Four Finger-handshapes in LSM

	RE (KING)
	ĦMAR (DONKEY)
	MEMORJA (MEMORY)

8.6.5 Group 5: Five Fingers Glyphs

The first set of Group 5 glyphs that were used interchangeably in LSM spellings were the five Fingers Spread Cup  and the Five Fingers Spread Cup Open  . These two glyphs are so close in form that they are almost identical. The following

spellings have been identified from the LMAP and have been included into Exercise 1, numbers 7 and 8 of the reading-questionnaire (Appendix C).



ĦANŻIR (PIG)



POST (PLACE)

The most common comment received about these two glyphs is that they seem to be identical, and three participants had trouble noticing the difference until it was pointed out to them. This indicates that they are quite certainly alloglyphs. In fact, the results indicate that 45% find the glyphs equally acceptable (Table 8.7). This indicates that either glyph can be adopted for the writing of LSM. Since there is a slightly higher shift in preference for the rounded glyph  (30%), this glyph is recommended to be adopted as a glyph (or grapheme, Section 2.3.3) for LSM.

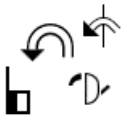
Table 8. 7: Deaf participants' preference for the first set of Group 5 glyphs

Name			Equally Acceptable
Participant 1	1		1
Participant 2			2
Participant 3		1	1
Participant 4	1		1
Participant 5	2		
Participant 6		2	
Participant 7			2
Participant 8	1	1	
Participant 9	1	1	
Participant 10			2
	(6)30%	(5)25%	(9)45%
Higher Frequency in Texts	*√*		

The second set of glyphs from Group 5 that appear to be interchangeable are the Cup Thumb Side  and the Hinge Open Thumb Side  . The following spellings have been identified from the LMAP and have been included into Exercise 1, numbers 9 and 10 of the reading-questionnaire (Appendix C).



ĦA ĦSIEB (TAKE CARE OF)



MAGĦMUDIJA (BAPTISM)

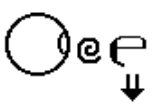
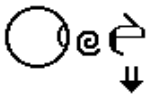
The feedback from the Deaf participants can be seen in Table 8.8. Here it can be seen that the highest preference is for the  glyph (55%). This glyph also happens to be the higher frequency glyph used in the LSM texts of the LMAP.

Table 8. 8: Deaf participants' preference for the second set of Group 5 glyphs

Name			Equally acceptable
Participant 1	2		
Participant 2		2	
Participant 3		1	1
Participant 4	1	1	
Participant 5			2
Participant 6		2	
Participant 7		2	
Participant 8	1	1	
Participant 9	1		1
Participant 10		2	
	(5) 25%	(11) 55%	(4) 20%
Higher Frequency in Texts		*√*	

The next set of glyphs from the Group 5 of the ISWA (Appendix B) used interchangeably are the Cup No Thumb  and the Cup Thumb Side  , as can be seen in the following spellings:

  ḤABIB (FRIEND)

  MISKIN (POOR-THING)

These variant spellings were included in the reading-questionnaire (Appendix C) in Exercise 1 numbers 11 and 12. The results of the feedback are displayed in Table 8.10. The glyph that is most strongly preferred is the  Cup Thumb Side glyph with 50%. The  glyph was preferred by several for the writing of MISKIN (POOR-THING). During the actual articulation of this sign the thumb tends to stay forward, and thus the difference between  Cup No Thumb and  Cup Thumb Side may be phonetic, reinforcing the idea that these glyphs may be alloglyphs.

The glyph  (Cup Thumb Side) is preferred here (Table 8.9), however in Section 8.6.6 it was seen that the Hinge Open Thumb Side glyph  is preferred to the Cup

Thumb Side glyph  . This may imply that neither the Cup No Thumb glyph 

nor the Cup Thumb Side glyph  are required for the writing of LSM, but that

 may be adopted as the LSM glyph (or grapheme see Section 2.3.3) to represent these alloglyphs (Section 2.6).

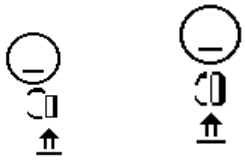
Table 8. 9: Deaf participants' preference for the third set of Group 5 glyphs

Name			Equally acceptable
Participant 1		2	
Participant 2		1	1
Participant 3	1	1	
Participant 4	2		
Participant 5	2		
Participant 6	2		
Participant 7	1	1	
Participant 8	1		1
Participant 9		1	1
Participant 10	1		1
	(10) 50%	(6) 30%	(4) 20%
Higher Frequency in Texts		√	

It is uncertain whether the next two glyphs from Group 5 of the ISWA are interchangeable or not 

(see Discussion Section). The following spellings are taken from the LMAP:

 MAZZ FLUS (STACK-OF-MONEY)



XOROB (DRINK)

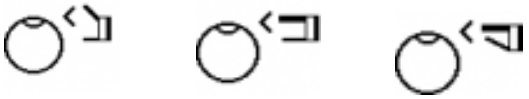
These variant spellings were included in the reading-questionnaire in Exercise 1 numbers 11 and 12. The results of the feedback are displayed in Table 8.10. There is a clear preference for the Cup glyph . However Participants 2, 6 and 8 claimed that the Cup Open glyph produces a different meaning in the sign MAZZ FLUS (STACK OF MONEY) . They commented that the Cup Open glyph represents a bigger stack of money than the Cup glyph . This comment indicates that these two glyphs may not simply be alloglyphs but distinct graphemes (see Section 8.10 Discussion). On the basis of these comments it is recommended that both glyphs are kept as glyphs (or graphemes Section 2.3.3) for the writing of LSM.

Table 8. 10: Deaf participants' preference for the fourth set of Group 5 glyphs

Name			Equally acceptable
Participant 1		2	
Participant 2		1	1
Participant 3			2
Participant 4	1	1	
Participant 5			2
Participant 6		2	
Participant 7		2	
Participant 8			2
Participant 9	1		1
Participant 10		1	1
	(2)	(9)	(9)

	10%	45%	45%
Higher Frequency in Texts		√	

The glyphs  Small-Hinge,  Hinge and  Open Hinge Thumb Forward are the next set of glyphs from Group 5 glyphs and they were used interchangeably in the following spellings of LSM:



RAĠEL (MAN)

PAPRA (DUCK)

These variant spellings were included in the reading-questionnaire in Exercise 1 numbers 23 and 24. The glyph most highly preferred is the  glyph with 45% (Table 8.11). Participant 6 preferred the Open Angle glyph, while Participant 8 preferred the closed angle glyph  for the writing of PAPRA (DUCK), commenting once again on the iconicity of the glyph of the shape of a duck's (see Section 8.10 Discussion).

Table 8. 11: Deaf participants' preference for the fifth set of Group 5 glyphs

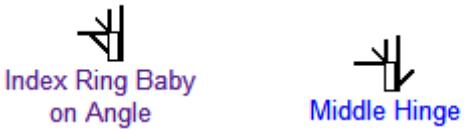
Name				Equally acceptable
Participant 1	2			
Participant 2			2	
Participant 3			2	
Participant 4			2	
Participant 5	1		1	
Participant 6		2		
Participant 7		2		
Participant 8	1		1	

Participant 9	1		1	
Participant 10		1		1
	5(25%)	5 (25%)	9 (45%)	1 (5%)
Higher Frequency in Texts		√		

8.6.7 Group 6: LSM Baby-hand (W-hand)

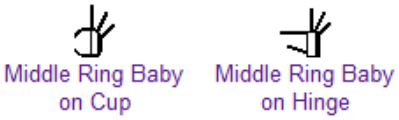
No low frequency glyphs were identified as interchangeable with higher frequency glyphs in Group 6 glyphs used in the LMAP. These glyphs are considerably different in graphic form from one another. Thus no glyph is reduced on the basis of being a possible alloglyph here.

8.6.8 Group 8: Index Ring Glyphs



Once again there appears to be no reason to reduce these two glyphs, since both are used for the representation of completely different signs. The Middle Hinge is used for ĠESU' (JESUS) and the Index Ring Baby on angle is used in part for the sign ŻWIEĠ (MARRIAGE) and they cannot be interchanged.

8.6.9 Group 9: Middle Ring and Index Thumb Glyphs

In Group 9 of the ISWA 2010 the first set of glyphs were identified as being interchangeable in spellings for LSM: 

The following

examples are taken from the LMAP and are inputted into the reading-questionnaire for feedback, in Exercise 1, numbers 15 and 16 (Appendix C):

GĦAQAD (JOIN)

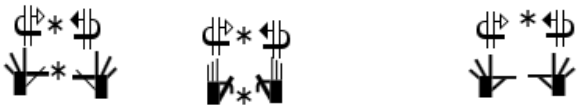
TOJLIT (TOILET)

There is a higher preference for the  glyph (Table 8.12). Thus this glyph is recommended as a grapheme for the writing of LSM and the other is considered to be an alloglyph. The 40% that claims either glyph will suffice, reinforce the hypothesis that the two glyphs are alloglyphs.

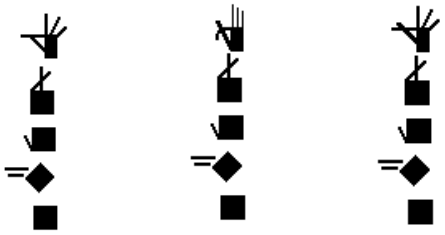
Table 8. 12: Deaf participants' preference for the first set of Group 9 glyphs

Name			Equally acceptable
Participant 1	1	1	
Participant 2		2	
Participant 3		1	1
Participant 4		2	
Participant 5			2
Participant 6			2
Participant 7	1	1	
Participant 8	1		1
Participant 9		1	1
Participant 10		1	1
	(3) 15%	(9) 45%	(8) 40%
Higher Frequency in Texts	√		

The next set of glyphs from the Group 9 of the ISWA (Appendix B) the Middle Ring Baby on Angle Out  Middle Ring Baby Unit on Hook Out  and Middle Ring Baby on Angle  . Evidence from the LMAP shows their interchangeable use in the spellings of LSM signs:



FAMILJA (FAMILY)



F.R.A.N.S (Fingerspelling)

These spellings were included in the reading-questionnaire (Appendix C) in Exercise 1, numbers 17 and 18. The highest preference is for the  glyph, followed by 'equally acceptable' (see Table 8.13) clearly indicating that the three glyphs are alloglyphs for LSM.

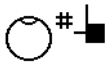
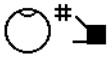
Table 8. 13: Deaf participants' preference for the second set of Group 9 glyphs

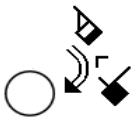
Name				Equally acceptable
Participant 1				2
Participant 2			2	
Participant 3			1	1 (for finger-spelling)
Participant 4			2	
Participant 5			1	1 (for finger-spelling)
Participant 6	2			
Participant 7				2

Participant 8			1	1 (prefers a different glyph)
Participant 9	1			1 (for finger-spelling)
Participant 10			2	
	(3) 15%	0%	(9) 45%	(8) 40%
Higher Frequency in Texts	√			

It is interesting to note that there was a high preference for the Middle Ring Baby Unit on Hook Out glyph  when used in fingerspelling. Participant 7 commented that the 'F' handshape in LSM is highly variable. This participant suggested that this is probably due to the positioning of the fingers in a configuration that is unnatural to the hand, thus probably leading to much variation in how the configuration is phonetically produced by individuals.

The next glyphs tested were the Index Thumb Hinge Open  and the  L-hand glyph. The following variant spellings are taken from the LMAP:

  "LOSER" (colloquial)

  QAMAR (MOON)

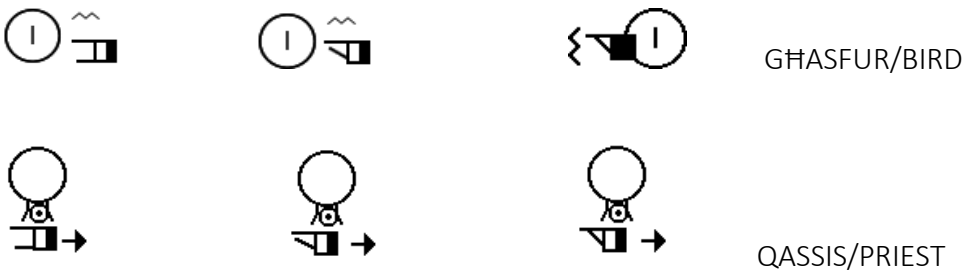
These spellings were placed into the reading-questionnaire, Exercise 1, numbers 19 and 20 (Appendix C) and results can be seen in Table 8.14. The preferred alloglyph is

the  glyph with 55%. This alloglyph is recommended to be adopted as a grapheme for the writing of LSM.

Table 8. 14: Deaf participants' preference for the third set of Group 9 glyphs

Name			Equally acceptable
Participant 1	1	1	
Participant 2	1	1	
Participant 3		2	
Participant 4	1	1	
Participant 5	1	1	
Participant 6		2	
Participant 7	1	1	
Participant 8		1	1
Participant 9	1	1	
Participant 10	1		1
	(7) 35%	(11) 55%	(2) 10%
Higher Frequency in Texts		√	

The next set of alloglyphs tested in this work is taken from their interchangeable use in spellings found in the LMAP:



These spellings were added to the reading-questionnaire (Appendix C), in Exercise 1, numbers 21 and 22. The highest preferred glyph is the  Index Thumb Hinge Large glyph with 60% (Table 8.15).

Table 8. 15: Deaf participants' preference for the fourth set of Group 9 glyphs

Name				Equally acceptable
Participant 1	2			
Participant 2	1	1		
Participant 3	1		1 (beak)	
Participant 4	1			1 (when beak)
Participant 5	1		1 (beak)	
Participant 6	2			
Participant 7	2			
Participant 8			2	
Participant 9	1			1 (beak)
Participant 10	1			1 (beak)
	(12) 60%	(1) 5%	(4) 20%	(3) 15%
Higher Frequency in Texts		√		

8.6.10 Group 10: Thumb Glyphs

No interchangeable glyphs for spellings were found that include the Group 10 glyphs used in the LMAP.

8.6.11 Discussion regarding LSM Handshape glyphs

The results show that the Deaf readers only once found a set of handshape glyphs 'equally acceptable'. The glyphs concerned were   . For all other glyphs Deaf readers seemed to have a preference for one or the other glyph and this indicates that the difference may be significant. At times the readers would state that one glyph represented 'larger' rather than 'smaller' referents.

Another glyph  was preferred 0%, therefore on the basis of this it is removed from the recommended glyph-set of LSM.

Thus in this section it can be concluded that only two handshape glyphs may be removed from the total of handshape glyphs found in the LMAP :  and  .

8.7 RESULTS: LSM MOVEMENT ALLOGLYPHS

In the LMAP there is a total of 124 movement BaseSymbol glyphs used from the 242 from ISWA 2010. In this section LSM spellings that involve variant movement glyphs are analysed to see whether all movement glyphs found in the LMAP are required for the writing of LSM. The names of the movement glyphs are taken from the ISWA 2010. More details can be found in Section 2.7 and Appendix B.

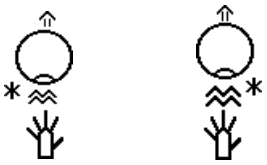
From the analysis of the movement glyphs two main patterns were observed. 1) There is a very high percentage of participants having no particular preferences towards the variant glyphs. This seems to imply that the variant glyphs are alloglyphs. 2) There was a large amount of comments indicating that the movement glyphs change depending on the context. Thus large movements would require large arrows and small movements small arrows. This seems to indicate that movement is part of the iconicity of sign language (see also Channon, 2002).

8.7.1 Group 11 Contact Glyphs

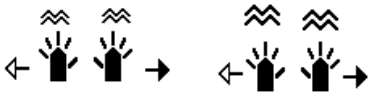
No minimal pairs at glyph-level were found in LSM spellings for Group 11 of Contact glyphs of the ISWA 2010 (Appendix B).

8.7.2 Group 12 Finger Movement

The following signs were found in the LMAP and included in the reading-questionnaire (Appendix C), Exercise 1, numbers 27 and 28. 75% find the glyphs of finger movement equally acceptable underlining their status as alloglyphs (Table 8.16).



META (WHEN)



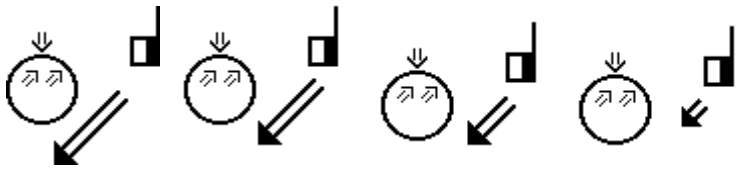
PJANU (PIANO)

Table 8. 16 Deaf participants' preference for one set of Group 12 glyphs

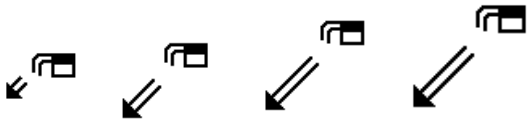
Name			Equally acceptable
Participant 1			2
Participant 2			2
Participant 3			2
Participant 4	1	1	
Participant 5			2
Participant 6		2	
Participant 7			2
Participant 8			2
Participant 9			2
Participant 10		1	1
	(1) 5%	(4) 20%	(15) 75%

8.7.3 Group 13 Straight Wall Plane Movement

In the reading-questionnaire (Appendix C), Exercise 1, numbers 29 and 30, the following glyphs used in spellings were presented to the Deaf participants for feedback. The results can be seen in Table 8.17.



CL-PERSUNA NIŻEL MIS-SEMA' (CL-PERSON COME DOWN FROM HEAVEN)



CL-ANIMAL NIŻEL MINN FUQ (CL-ANIMAL COME DOWN)

Table 8. 17: Deaf participants' preference for the first set of Group 13 glyphs

Name					Equally acceptable
Participant 1			1		1
Participant 2					2
Participant 3					2
Participant 4					2
Participant 5					2
Participant 6			2		
Participant 7					2
Participant 8					2
Participant 9					2
Participant 10				1 (if from Heaven)	1
			(3) 15%	(1) 5%	(16) 80%

In the reading-questionnaire (Appendix C), Exercise 1, numbers 31 and 32 questioned the following variant glyphs:

MEJDA (TABLE)

ĦANUT (SHOP)

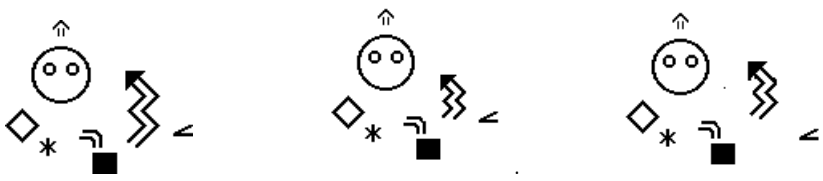
In Table 8.18 it can be seen that 70% find the glyphs equally acceptable.

Table 8. 18: Deaf participants' preference for the second set of Group 13 glyphs

Name			Equally acceptable
Participant 1			2
Participant 2			2
Participant 3	1		1
Participant 4	1	1	
Participant 5			2
Participant 6	1	1	
Participant 7			2
Participant 8			2 (it changes meaning)
Participant 9			2
Participant 10		1	1
	(3) 15%	(3) 15%	(14) 70%

In the reading-questionnaire (Appendix C), Exercise 1, numbers 33 and 34, the following variant movement glyphs were presented to the Deaf participants for feedback:

FIS-SAKRA/DRUNK



TELA'GO-UP

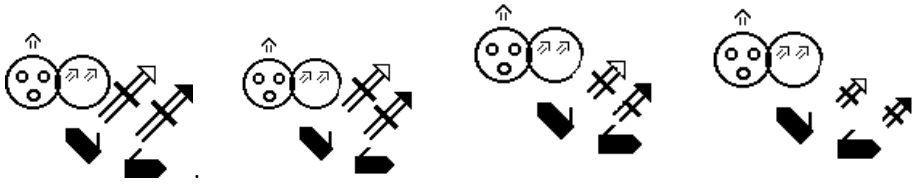
The results can be seen in Table 8.19. Once again the majority, 70%, of all responses indicate that the glyphs are equally acceptable.

Table 8. 19: Deaf participants' preference for the third set of Group 13 glyphs

Name				Equally acceptable
Participant 1				2
Participant 2				2
Participant 3		1	1	
Participant 4			1	1
Participant 5				2
Participant 6			2	
Participant 7				2
Participant 8				2
Participant 9				2
Participant 10			1	1
		(1) 5%	(5) 25%	(14) 70%

8.7.4 Group 14 Straight Diagonal Wall Plane

In the reading-questionnaire (Appendix C), Exercise 1, numbers 35 and 36, the following variant movement glyphs were presented to the Deaf participants for feedback. The results can be seen in Table 8.20 showing 65% as equally acceptable.



TAR (FLY)

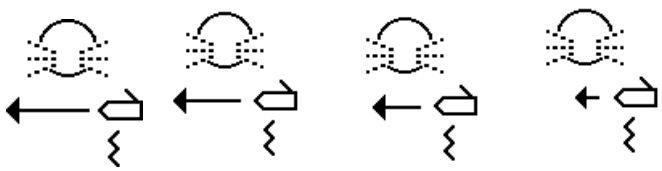
AJRUPLAN TELA'(PLANE GO-UP)

Table 8. 20: Deaf participants' preference for one set of Group 14 glyphs

. Name					Equally acceptable
Participant 1					2
Participant 2					2
Participant 3			1		1
Participant 4				2	
Participant 5					2
Participant 6				2	
Participant 7					2
Participant 8					2
Participant 9				1 (larger dist)	1
Participant 10		1 (normali)			1
		(1) 5%	(1) 5%	(5) 25%	(13) 65%

8.7.5 Group 15 Straight Floor Plane Move

In the reading-questionnaire (Appendix C), Exercise 1, numbers 37 and 38 the following variant movement glyphs were presented to the Deaf participants for feedback.



ĦUT-GĦAM (FISH SWIM)

 CL-VETTURA MEXA ‘L QUDDIEM (CL-VEHICLE MOVE FORWARD)

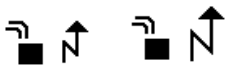
The results can be seen in Table 8.21. 65% of the responses find all glyphs equally acceptable.

Table 8. 21: Deaf participants’ preference for the first set of Group 15 glyphs

Name					Equally acceptable
Participant 1		1			1
Participant 2					2
Participant 3		1			1
Participant 4				1	1
Participant 5					2
Participant 6			1	1	
Participant 7					2
Participant 8					2
Participant 9		1 (normal size)			1
Participant 10	1				1
	(1) 5%	(3) 15%	(1) 5%	(2) 10%	(13) 65%

In the reading-questionnaire (Appendix C), Exercise 1, numbers 41 and 42 preference between the following spellings was asked:

 CL-VETTURA MEXA ŻIGUŻAJG ‘L QUDDIEM (CL-VEHICLE ZIGZAG FORWARD)



CL-ANNIMAL MEXA ŻIGUŻAJG ‘L QUDDIEM (CL-ANIMAL ZIGZAG FORWARD)

80% of the responses found the two glyphs equally acceptable (Table 8.22)

Table 8. 22: Deaf participants’ preference for the second set of Group 15 glyphs

Name			Equally acceptable
Participant 1			2
Participant 2			2
Participant 3			2
Participant 4	1	1	
Participant 5			2
Participant 6		1	
Participant 7			2
Participant 8			2
Participant 9			2
Participant 10			2
	(1) 5%	(2) 10%	(16) 80%

8.7.6 Group 16 Curves Parallel Wall Plane Movement

In the reading-questionnaire (Appendix C), Exercise 1, numbers 43 and 44, the following variant movement glyphs were presented to the Deaf participants for feedback:

SEMA’ (SKY)

QABEŻ (JUMP)

The results can be seen in Table 8.23. 50% of all responses found the four glyphs equally acceptable.

Table 8. 23: Deaf participants' preference for the first set of Group 16 glyphs

Name					Equally acceptable
Participant 1			1	1	
Participant 2					2
Participant 3			2		
Participant 4				1	1
Participant 5					2
Participant 6			1	1	
Participant 7				1 (sema)	1
Participant 8					2
Participant 9				1 (sema)	1
Participant 10				1 (sema)	1
			(4) 20%	(6) 30%	(10) 50%

8.7.7 Group 17: Curves Hit Wall Plane

No glyphs have been used in the LMAP from Group 17 (Appendix B).

8.7.8 Group 18: Curves Hit Floor Plane

In the reading-questionnaire (Appendix C), Exercise 1, numbers 47 and 48, tested the curves hit floor plane BaseSymbol glyph.

ILU-ILU (LONG TIME AGO)

TWIELED (BORN)

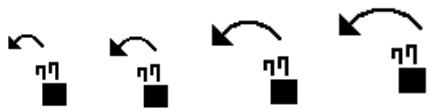
In Table 8.24, it can be seen that 55% found the glyphs equally acceptable.

Table 8. 24 Deaf participants' preference for the first set of Group 18 glyphs

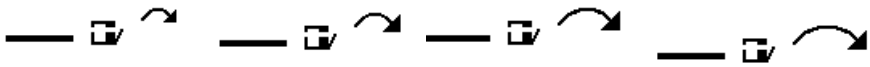
Name			Equally acceptable
Participant 1	1		1
Participant 2			2
Participant 3	1		1
Participant 4	1	1	
Participant 5			2
Participant 6		2	
Participant 7		2	
Participant 8			2
Participant 9			2
Participant 10	1		1
	(4) 20%	(5) 25%	(11) 55%

8.7.9 Group 19: Curves Parallel Floor Plane

In the reading-questionnaire (Appendix C), Exercise 1, numbers 49 and 50, the following spellings were presented to the Deaf participants to check for preference.



. CL-ANIMAL DUR (CL-ANIMAL TURN)



. IFTAĦ BIEB (OPEN DOOR)

In Table 8.25 it can be seen that 60% of responses found all the glyphs equally acceptable.

Table 8. 25: Deaf participants' preference for the first set of Group 18 glyphs

Name					Equally acceptable
Participant 1					2
Participant 2					2
Participant 3		1		1	
Participant 4			2 (normal size)[46]		
Participant 5				1	1
Participant 6				2	
Participant 7					2
Participant 8					2
Participant 9					2
Participant 10			1 (normali)		1
		5% (1)	(3) 15%	(4) 20%	(12) 60%

8.7.10 Group 20: Circles Movement

In the reading-questionnaire (Appendix C), Exercise 1, numbers 51 and 52, the following spellings that vary only in the movement glyphs were presented to the Deaf participants to ask for their preference. 60% the glyphs equally acceptable (Table 8.26). There are spellings with one and two arrow heads. One arrow head in SW means one circular movement, while the two arrow heads mean repeated movement:

.  .  SKUŻI (SORRY)

 ĦELLOW (HELLO)

[46] For discussion on 'normal'('neutral') arrows see Section 8.10.5.

Table 8. 26 Deaf participants' preference for the first set of Group 20 glyphs

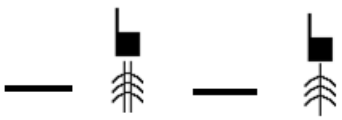
Name					Equally acceptable
Participant 1		1		1	
Participant 2					2
Participant 3	1		1		
Participant 4	1		1		
Participant 5					2
Participant 6				2	
Participant 7					2
Participant 8					2
Participant 9					2
Participant 10					2
	(2) 10%	(1) 5%	(2) 10%	(3) 15%	(12) 60%

8.7.11 Group 16 and Group 19: Arm Movement

These glyphs are taken from different ISWA 2010 Groups, however it has been observed that they are used interchangeably in spellings involving arm-movement.

In the ISWA 2010 the rule is that if the  double lines is used it represents arm movement parallel to the wall and the  glyph is used to represent arm movement parallel to the floor.

The following examples of spellings are taken from the reading-questionnaire (Appendix C), Exercise 1, numbers 45 and 45.



XIEX (WHAT)

 SIĠRA (TREE)

In Table 8.27 it can be seen that 50% find  and  both equally acceptable. 40% preferred the  one-lined glyph. Possibly this was preferred because the straight line in the glyph seems to represent the arm and this is thus preferred.

Table 8. 27 Deaf participants' preference for the first set of Group 16 and Group 19 glyphs

Name			Equally acceptable
Participant 1		2	
Participant 2		2	
Participant 3	1		1
Participant 4			2
Participant 5			2
Participant 6		2	
Participant 7		2	
Participant 8			2
Participant 9			2
Participant 10	1		1
	(2) 10%	(8) 40%	(10) 50%

8.7.12 Discussion concerning Movement alloglyphs

From the results of this section it is clear that the majority of Deaf readers found the different movement glyphs used interchangeably in spellings as equally acceptable. Unlike handshape movement glyphs it is suggested that the number of glyphs for the writing of LSM is reduced, since both for the writer and the readers the use of different glyphs does not result in a change of meaning of the signs.

8.8 RESULTS: LSM ALLOGLYPHS FROM OTHER GROUPS

8.8.1 Group 21-Group 24: Dynamics

No minimal pairs at glyph-level were found in spellings from the ISWA 2010 Group 21 'Dynamics', Group 22 'Head', Group 23 'Brows Eyes Eyegaze', Group 24 'Cheeks Ear Nose Breath' (Appendix B). Future research could examine these areas of LSM.

8.8.2 Group 25: Mouth Lips

Only one mouth pattern was considered in this work. In the reading-questionnaire (Appendix 3), Exercise 1, numbers 53 and 54 the Deaf participants were asked about their preference for the smile in the introductory words 'ĦELLOW/HELLO' and 'ĊAW/BYE'.

. ĦELLOW (HELLO)

ĊAW (BYE)

Table 8. 28: Deaf participants' preference for the first set of Group 25 glyphs

Name			Equally acceptable
Participant 1	1		1
Participant 2			2
Participant 3	2		
Participant 4	2		
Participant 5	2		
Participant 6	2		
Participant 7	2		
Participant 8	2		
Participant 9	2		
Participant 10	2		
	(17) 85%		(3) 15%

For this set of glyphs, 85% preferred the 'smiley face' glyph  for the spellings of HELLO and BYE (Table 8.28). However it cannot be assumed that these are two alloglyphs, because the head glyph  is required in writing of LSM as it is often used to identify the location parameter.

It was observed that the preference for the smile on the face was immediate and the participants were unhesitant while answering this question. There is not one participant who preferred the signs ĦELLOW (HELLO) and ĊAW (BYE) without the smile, and only 15% of the responses found them both equally acceptable. Hoffmann-Dilloway (2011) described the attitude of a Deaf user of ASL towards the smile in SW. This signer also preferred to include the smile in some signs and considered the smile to be a nuance of his language that could not be left out. One participant in this study actually wrote in capital letters 'PART OF LSM' in the reading-questionnaire.

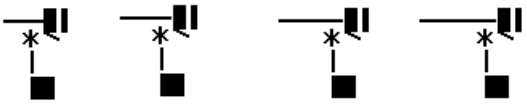
8.8.3 Groups 26-27

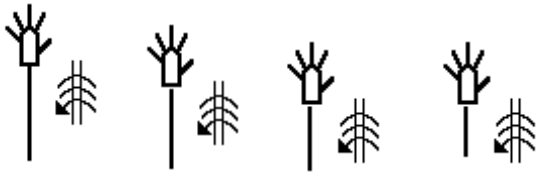
No minimal pairs at glyph-level were found in spellings of the LMAP. Group 26 contains 'Tongue Teeth Chin Neck' glyphs and Group 27 'Trunk' glyphs.

8.8.4 Group 28: Limbs

There are a few glyphs from the Body glyphs, used for the writing of LSM, that may not be necessary. As can be seen below there are four symbols used in the LMAP that represent four different limb lengths:

In the LMAP Limb Length 1, 2, 3 and 4 are all used interchangeably to represent the arm. It is clear that only one limb symbol is needed for the writing of LSM and the four lengths are alloglyphs. Deaf participants were asked about preference for limb length in the reading-questionnaire (Appendix C), Exercise 1, numbers 25 and 26.


ĦIN (TIME)


SIĠRA (TREE)

In Table 8.29 the result is provided. 80% have no preference and find them 'equally acceptable' strongly indicating that the different limb glyphs are alloglyphs. During many of the responses to the reading-questionnaire the Deaf participants were unable to see/perceive the difference in arm length for the sign ĦIN/TIME. Participant 7 believes that the longer limb reads easier as arm, however on the other hand, Participant 8 believes that the shortest length suffices for the writing of tree, since it is adequately iconic of the trunk of a tree and is more economical. Since there is no pattern of preference, either alloglyph may be chosen as the recommended glyph for the writing of LSM.

Table 8. 29 Deaf participants' preference for Limb lengths

Name					Equally acceptable
Participant 1					2
Participant 2					2
Participant 3					2
Participant 4					2
Participant 5				1	1
Participant 6					2
Participant 7				2	
Participant 8	1				1
Participant 9					2
Participant 10					2
	1(5%)	0%	0%	3 (15%)	16 (80%)
Higher Frequency in Texts		√			

8.8.5 Punctuation glyphs

The punctuation glyphs in the LMAP are the 'stop' and 'pause' glyph. These are not alloglyphs since they are not interchangeable. The questioned is whether more punctuation glyphs are required for the marking of exclamations and question marks. So far in the LMAP these two glyphs have not been necessary, since an utterance is marked as a question, exclamation or statement by the head-tilt patterns (see Section 6.8).

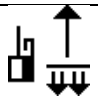
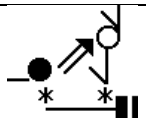
8.9 ALLOGLYPHS IN THE OTHER NINE LITERATURE PUDDLES?

Each literature Puddle (Section 8.4) was searched in order to find a low frequency glyph that has been used in spellings that is similar in shape to a higher frequency glyph (see Table 8.30). The researcher is aware that a more thorough investigation of the other Puddles is required. The reason for including the examples here is to

get some insight into how the written form in other literature Puddles tends to develop. It was observed that the other Puddles share patterns with the LMAP in the development of their use of SW.

In Table 8.30 an example of a low frequency glyph used in one spelling found in the 9 largest literature Puddles (no example is given for LSM since Section 8.6-8.8 are full of such examples). The question is whether the higher frequency glyph can replace the lower frequency glyph and thus indicate that the two glyphs may be alloglyphs.

Table 8. 30 Low and High Frequency Glyphs in the nine Puddles with spelling using low frequency glyph (spellings taken from the different Puddles).

Puddle	Low Freq Glyph	High Freq Glyph	Spelling with Low Freq Glyph
ASL Bible			
Brazil			
Czech			
Germany			
Nicaragua			

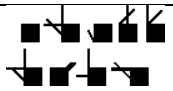
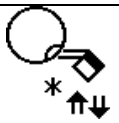
Norway			
Spain			
Tunisia			
US			

Table 8.31 presents only one example from each Puddle. Although this is very little data the examples point to a pattern observed in all the literature Puddles, including the LMAP. This pattern is that SW spellings are not kept always constant in a given Puddle. It is argued here that this happens because the ISWA 2010 glyph set is so large that several glyphs are only very slightly different from one another, thus the writer tends to forget the exact glyph used and chooses a similar glyph in the writing of that spelling at a later stage.

Every literature Puddle has low and high frequency glyphs that are very similar in form and are used for spellings of the language. These similar glyph forms may be interchangeable, but this can only be decided by competent users of the sign language. However for the ASL Bible the spelling for fingerspelling D.A.V.I.D has been found with two variants of the handshape V:  and  . This indicates

that the two glyphs may be alloglyphs in ASL. The glyph-forms  and  may represent physically different handshapes that may be allophones in ASL.

If these low and high frequency glyphs are interchangeable when used in the same spellings, it may be argued that the different glyph forms are alloglyphs (see also Section 2.6). An alloglyph is evidence that the difference represented between the two glyph-forms is phonetic and not phonological. A deeper investigation into all the spellings of a Puddle that contain interchangeable glyphs may help distinguish which handshapes, movements and dynamics, head/face features and body locations glyphs (Appendix B) are phonetic and which are phonemic in a sign language. The analysis of a glyph-set may prove to be a method of investigating the phonemes of sign language. A deeper analysis of LSM spellings has been carried out in Section 8.6-8.8.

Adam Frost carried out an analysis of the 'truly needed' ASL handshape glyphs found in the ASL Puddles. Frost carried out the exercise of searching for high and low frequency glyphs of handshapes for the US Puddle to compile a manual with ASL handshapes (Frost & Sutton, 2013). He presented to the SW List 83 handshapes that he had reduced from a larger group of glyphs in the Puddle, and asked ASL users if any handshapes were not listed. The correspondence was made to the SW List (dated 22/04/2013).

One person on the list answered that another handshape was required. In response to this Frost wrote: "The reason I didn't add it is because I could write it like this [gave SW of the same sign with a different handshape] and not need that symbol."

The person pursued the matter and claimed that the handshape Frost had written was physically different to the intended sign and in response Frost wrote "The question is does it really matter to the meaning if it is split or spread into a full 5-hand?" Frost's informal exercise is evidence that the method applied here for identifying the 'meaningful' glyphs is repeatable for other sign languages.

8.10 DISCUSSION: EQUALLY ACCEPTABLE GLYPHS

In the following sections discussion about the results of the investigation of the Deaf readers' preferences is carried out.

8.10.1 Handshape and Movement Glyphs - Differences

The results of the Deaf participants' preferences indicate that there is a difference between the acceptability of different glyphs for movement and for handshapes. There are more movement glyphs that are marked as equally acceptable, than handshape glyphs. An average of 65% of all responses found the movement glyphs equally acceptable, whereas 22.5% of all responses found the handshape glyphs equally acceptable. This indicates that the slight form distinctions of handshape glyphs may be more significant than the slight distinctions in form between the movement glyphs.

Each set of alloglyphs was taken from the same SW group, for instance spellings that vary in glyphs found in Group 1 (see Section 8.6.1) or Group 20 (see Section 8.7.10). The movement glyphs within a given SW group vary mainly in the size of the arrows. Handshapes vary in shape and at times size where slight form-distinctions can be

seen in the size of the openings of the hands (see Section 8.6.5). There may be further alloglyphs across SW groups, e.g. imagine an LSM spelling that uses an index handshape from Group 1 and an Index-Middle handshape from Group 2 interchangeably. However in this work only alloglyphs within the same SW Group were investigated. Further research could search for alloglyphs across different SW Groups, but this is not carried out here.

On the basis of the results it cannot be concluded that the difference between the handshape glyphs is insignificant and not distinctive. They are not simply glyphs representing phonetic differences. If this were so a higher percentage for equally acceptable would have been expected. Therefore there must be something meaningful that the participants were aware of.

The percentage of equally acceptable movement glyphs indicates that the graphical distinctions between them are less distinctive and significant than the handshape glyphs.

In phonological inventories of sign languages it has been easier to contain the number of handshapes rather than the movement. Many studies point to the number of handshapes of sign languages but few talk of the number of movements available. This is probably due to the iconic nature of movement. Channon (2002) talks of the predictable iconicity (Section 4.2.3) where it is claimed that this iconicity has no phonological representation.

Movement of classifiers has been understood as predictable iconicity (Channon, 2002) since it mimics real-life movement, and so the number of possibilities for

classifier movement is innumerable. In this work, it is proposed that a small set of movements is required for the writing of LSM, and that this small set has the possibility to be modified (or marked).

8.10.2 Alloglyphs: Is there enough evidence?

In this chapter LSM spellings that differ in the use of similar glyph-forms have been analysed. These variant glyph-forms have been referred to as 'alloglyphs', i.e they represent phonetic differences between two forms. This claim is made on the basis that the spellings of signs remain readable with either variant-glyph (Sections 8.6-8.8).

A question may arise concerning the criteria establishing the significance of the glyphs. How can the researcher be certain that the glyphs that are less preferred by the participants are not significant glyphs for other spellings? For instance it was found (Section 8.6.5) that between the Cup Thumb Side  and the Hinge Open Thumb Side  glyph, the  glyph was preferred. However, in another two set of spellings the Cup No Thumb  and the Cup Thumb Side  glyphs were questioned for preference. In this case the Cup Thumb Side  glyph was preferred. Does this mean that the  glyph is required, or can it be implied that since the  glyph was preferred over the  glyph then the  should suffice to represent all three glyphs:    ?

Ideally minimal pairs would be found concerning all the glyphs, however this is not possible as minimal pairs in sign language are not easy to be found (Section 4.2.5).

8.10.3 Iconicity of a sign language and the glyph-set

> A serious theoretical problem at the sub-lexical level is due to the fact that sign languages are much more iconic than spoken languages, with many signs "looking like" what they mean to some degree. (Shwager and Zeshan, 2008, p. 511)

In Chapter 4, Section 4.2 it was seen how sign languages are visual languages and that the iconicity of sign languages presents a challenge to the traditional structural theory of languages. Channon (2002) described two types of iconicity: Lexical iconicity and Predictable Iconicity. Lexical iconicity needs to be learnt since it is language specific iconicity, such as DAR (HOUSE) in LSM where the hand is iconic of the flat roofs of houses in Malta. In this example the shape of the hand is iconic. In another sign such as XITA (RAIN) the handshape is iconic of the drops of water and the movement is iconic of these drops falling. This is lexical iconicity.

The other type of iconicity is predictable iconicity (Channon, 2002, p. 106). This iconicity is not language specific but seems to be common across all languages. In the sign VETTURA-QOMOS (VEHICLE-BOUNCE) the classifier handshape is language specific, for LSM it is a B-Hand whereas for ASL it is an 8-hand. On the other hand the movement is the same (up-down-up-down). Channon (2002) proposes that predictable iconicity has no phonological representation (p. 105).

Crasborn et al.'s (2000) theory suggests that the distinction between handshapes such as 

and 

is not phonemic, but phonetic (thus meaning larger and smaller classifier handshapes). Crasborn et al. (ibid.) were also aware that the difference cannot be merely phonetic, since the distinction between the two handshapes is meaningful when seen as a classifier handshape (see Section 8.6.5). They thus proposed that the relative difference between these handshapes is stored in the lexicon. They acknowledge that this is problematic since it does not fit into the hierarchy of structural theory of linguistics, but they are suggesting that the phonetics of a sign language are stored in the lexicon.

SW can represent predictable iconicity. The question here is what is required from SW to write the predictable iconicity of a specific language, LSM? Are all the BaseSymbol glyphs of the ISWA 2010 required in order to be able to write the predictable iconicity of LSM?

Additionally another issue arises from this. In Section 3.6 writing systems were described and SW, as a general writing system for sign languages, was understood to be a featural system. When SW is adapted to write a specific sign language the resulting system may be described as an alphabet of a given sign language. However if predictable iconicity has no phonological representation, then this part of a given sign language cannot be described as alphabetic, since a letter or a group of letters of an 'alphabet' represent the level of the phoneme of a language. If the predictable iconicity of a sign language is stored in the lexicon, then this would mean that, at

least for predictable iconicity, SW is a logogram system. Thus here another proposal is made.

The phonemes for LSM reflect the visual nature of the language although they are at a level of abstraction. Thus although a phoneme is traditionally described as the minimal meaningless unit of a language (Crystal, 2011, p. 361-362) , for LSM, and perhaps for other sign languages, the phoneme cannot be entirely meaningless or abstract due to the visibility of the phones that represent it.

Thus the phonological segments of LSM represent the visual nature of the phones and may thus be considered as being used meaningfully. Rather than explaining that the iconic phonemes of a sign language are phonetic units stored in the lexicon (Crasborn et al., 2000) here it is suggested that LSM phonemes contain visual information that cannot be avoided. This visual information includes elements such as relative size, e.g. largeness vs smallness of the openings of a hand and thinness vs. thickness in the difference between a baby-C and a C hand. This concurs with Channon's (2002) suggestion that another layer maybe required to account for grammars – iconicity.

This suggestion is challenging if a strict traditional Saussurean view of Language is assumed, i.e. meaningless units combine together to produce meaningful units (Hockett, 1959). There is however a growing area of research that investigates and challenges the strict traditional claim of arbitrary linguistic forms in spoken and signed languages (cf. Armstrong, 1983; Perniss, Thompson & Vigliocco, 2010; Thompson, Vinson, Woll & Vigliocco, 2012; Schmidtke, Conrad & Jacobs, 2014). The

more recent works are providing evidence of non-arbitrary relations between linguistic sounds and semantics in both spoken and signed languages (Thompson, Vinson, Woll & Vigliocco, 2012; Schmidtke, Conrad & Jacobs, 2014).

Sign languages are patterned in the visual medium not the auditory medium and thus the phone that represents the phoneme is visual. Two visible objects, e.g. two tables near each other, carry information about their relative size and shape and this information cannot be avoided. In the same way two handshapes are visible and their visible nature carries information about their relative shape and size. Thus for sign language the level of the phoneme cannot be entirely meaningless because of the inherent visual qualities of the articulators (i.e. visible shapes of hands, visible movements, visible locations such as head and torso).

On the basis of this understanding and from the results of the LSM glyph-set from the LMAP it is proposed here that the LSM glyph-set is re-organized into a smaller grapheme-set that represents phonemes that can be modified visually to express relative iconic meanings of size and shape – hence handshapes can be modified for relative size of opening of hands and movements can be modified to visually encode relative distance and shape of movement (e.g. bounce and zigzag).

In this way SW for LSM[47] can still be classified as an alphabet – but a different alphabet due to the modifiable nature of the iconic and transparent graphemes. The term 'allographs' could be considered to refer to the modified forms of LSM

[47] See Section 3.6 concerning the difference between SW when used asa general writing system and thus being referred to as a featural system, and SW when used to write a specific SL (an orthography) and thus referred to as an alphabet.

graphemes. In Section 8.5.1 it was seen that the term 'allo' implies non linguistically distinct phenomena, and since it is argued here that the graphemes modified forms can never be entirely meaningless due to their visual nature, then it has been decided to avoid the term 'allograph'. In this work, the modified LSM graphemes of LSM are called grapheme-variants. In order to contain the 'limitless' nature of predictable iconicity, a few rules could be applied to a small set of graphemes[48].

The visual nature of SL phones may explain why it has been difficult to arrive at the exact amount of phonemes of all parameters of sign language. The iconic-transparent nature of SL phones allows for a large amount of possible modifications of the phones, which are also iconic in nature. In this work the low percentage of handshape glyphs have been marked as 'equally acceptable' probably because the glyphs have inherent iconic nature and even if just minimally different from one another still have visual information that is meaningful.

On the other hand for the movement glyphs questioned in this work, there is a higher percentage of equally acceptability because the distinction between the movement glyphs concerned was not the shape but rather the size of the arrows. Though also visually distinctive, a long arrow and a longer arrow are much more visually similar than two different handshapes. When the movement is an internal

[48] It could be suggested, for instance, that each LSM grapheme includes two potential grapheme-variants in order to write predicatable iconicity in LSM when necessary. The two grapheme-variants would include a smaller sized form and a larger sized form. For handshapes this relative size would be the relative size of the opening of hands. In this work, the handshape grapheme-set for LSM is established and all these potential grapheme-variants are not included in the manual. However future research may re-visit this area and make adaptations to the handshape grapheme-set of LSM accordingly. The work here offers a base for future investigation.

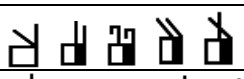
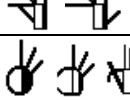
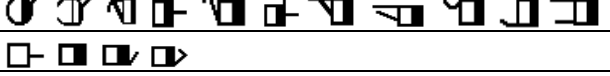
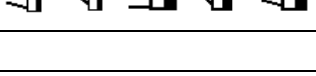
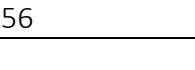
movement of a sign such as the movement in the sign SEMA' (SKY) a long or short movement is not distinctive, however the same long or short meaning is distinctive when used as a path movement of classifiers (e.g. one vehicle move forward-long vs. one vehicle move forward-short).

8.10.4 LSM Grapheme-Set for Handshapes and Movement

On the basis of this proposal (Section 8.10.3) so little equal acceptability for the handshape glyphs may be due to the iconic nature of sign language, and thus here it is recommended to keep the handshape glyph-set as found in the LMAP with the minor reduction of two handshape glyphs  and  (Section 8.6.11).

The glyphs which were least preferred are not recommended to be discarded from the handshape-grapheme inventory of LSM, since they have not been marked as equally acceptable - rather they are grapheme-variants. The glyph-set for the writing of LSM is now referred to as the grapheme set (see Figure 8.6). The handshapes are taken from those used in the LMAP (Appendix F). In the LMAP 74 handshape-glyphs were used. The complete list of handshape graphemes for the writing of LSM concluded from this work consists of 56 handshape graphemes and 13 grapheme-variants.

Figure 8. 6: 56 handshape graphemes and 13 grapheme-variants of LSM

	Handshape Graphemes of LSM	Grapheme-Variants
1		
2		
3		
4		
5		
6		
7	none	
8		
9		
10		
	56	13

As for the movement grapheme-set for LSM, here it is proposed that the movement-glyph set found in the LMAP (Appendix F Groups 13-20) is largely reduced for the writing of LSM. The proposed movement grapheme-set can be seen in Figure 8.7.

Bianchini (2012) noted that the SW movement glyphs are not all patterned in the same way. She recommended a more patterned glyph-set for the writing of LIS, where she found that the Deaf participants in her study preferred a more patterned system. Bianchini (2012) suggested that four different movement lengths are created for every movement glyph. Here, however it is recommended that only one length of each arrow glyph is adopted as BaseSymbol glyph (rather than the long list of movement arrow BaseSymbol glyphs of the ISWA 2010, see Appendix B).

It is suggested that each movement grapheme (Figure 8.7) represents the LSM movement phoneme. Variations of this grapheme may be necessary (see discussion in Section 8.10.3) and thus each LSM arrow grapheme of LSM may be modified to 1) increase in length, 2) decrease in length, 3) be repeated, and 4) combine with other movement-arrow graphemes. Each arrow-grapheme may also rotate (Section 2.6) and be modified to represent dominant or non-dominant hand movement (Section 2.7.2).

Sutton's SW system (Chapter 2) does account for different sizes of arrow-glyphs and repetitions. However, what is proposed here is that for the LSM orthography a different categorisation of the arrow glyphs is formed. This categorization is based on the Deaf readers' perception of the variant sizes of arrow-glyphs as alloglyphs (Section 8.7). From this work it may be concluded that a large number of arrow-glyphs categorized as BaseSymbol glyphs in the ISWA 2010 need not be considered to be BaseSymbol graphemes for LSM.

The proposed LSM movement grapheme-set would mean that a small closed-set of movement-graphemes are required for the writing of LSM. However, each grapheme may then be modified and may combine with other arrow-graphemes in innumerable ways and thus allow for the representation of predictable iconicity when necessary. These variations of the arrow graphemes are referred to in this work as 'grapheme-variants'.

Figure 8.7 shows the re-organized SW LSM movement graphemes. This figure is repeated here from Figure 9.29 for ease of reading. In its original section (Section

9.10.3) further details concerning what lead to this proposed arrow grapheme-set is described.

Figure 8. 7: LSM movement arrow graphemes (see also Figure 9.29)

Movement Arrow Grapheme-Set for the writing of LSM		
HORIZONTAL PLANE	VERTICAL PLANE	AXIAL MOVEMENT
 FORWARD	 UP/DOWN	 ARM ROTATE
 ZIGZAG	 ZIG ZAG UP	 WRIST FLEX
 CURVE	 CURVE UP	
 WAVE	 WAVE UP	
	 UP-DOWN	
	 BOUNCE	
	 SPIRAL-UP	
	 UP AND OVER	
	 CIRCLE	
	 UP OVER CIRLE	
	 DOWN-UNDER	

8.10.5 Metalinguistic Awareness

Some observations were made about the metalinguistic awareness of the participants. Participant 7 read the SW sign ĦABIB (FRIEND) with thumbs protruded

forward  , however commented that the other spelling was clearer and thus chose the symbol  as the preferred glyph for the writing this sign. This shows a level of metalinguistic awareness that has been observed in detail in Bianchini's (2012) doctoral dissertation regarding LIS readers of SW. Here Participant 7 was able to analyse preference for the written form of a sign on the basis of the graphic representation of the intended sign. This participant was able to move away from the glyph as simply representing an icon of her own idiosyncratic handshape.

Participants 4, 9 and 10 at times indicated a 'neutral' glyph for the representation of LSM, which they would refer to as 'normali' (normal). What they were implying was that from a set of movement arrows one arrow was considered to be a neutral arrow that represents movement that is not marked by size (e.g. large vs tiny). This lead to the researcher's understanding of neutral glyphs vs. marked glyphs and thus the suggestion for one basic arrow glyph (neutral) that may be modified in length to show short and long movements (Section 8.10.4).

Another observation that was made was of the openness of the handshape glyphs. One participant commented that he preferred the closed handshape of BIRD because it resembles a bird's beak. Likewise he preferred the closed handshape of PAPRA (DUCK) for the same reason. It is questioned whether this participant is aware of what a written representation is – that it represents the articulation of the sign, not the sign itself. The participant has low literacy skills in Maltese and this may reflect in the awareness of what SW is all about.

On the other hand for the same two signs, another participant with higher literacy skills in Maltese and English preferred the open handshape and the reason for this was because this is the way the sign starts. This indicates a higher level of phonological awareness of LSM where this participant is aware of the sequential aspect of the sign – where the hand starts in open position and then closes.

Participants 3, 5 and 8 preferred the closed hand position  for the writing of GĦASFUR (BIRD).

The wide range of preferences for the closed or open hands in BIRD and DUCK (See also Section 8.6.9) further reinforces the theory that the graphemes (phonemes) contain inherent visual meanings that can be modified to bring about natural visual meanings in the relative of the openness of the hands. The modification 'rules' proposed in this work have been discussed in Section 8.10.3.

8.11 CONCLUSION

In this chapter an analysis of the glyph-set of LSM as used in the LMAP was carried out. In the first section a look at SignPuddle 2.0 and its global use together with an analysis of the ten largest literature Puddles was carried out in order to place the LMAP in context.

The LSM glyph-set for handshapes and movement, as used in the LMAP was then analysed. The results of the Deaf participants' preference of glyphs from a choice of similar glyph-forms were presented and analysed (Sections 8.6-8.8). On the basis of

the findings and the theory, a collection of LSM handshapes and movement graphemes and grapheme-variants is presented in Section 8.10.4.

Additionally a discussion on the status of the phoneme of LSM and the implications of this regarding the written form of the LSM phoneme was carried out in Section 8.10.3.

CHAPTER 9: THE LSM SW WORD AND SENTENCE: AN ANALYSIS

9.1 INTRODUCTION

In the previous chapter, the SW glyph-set found in the LMAP was analysed in order to arrive at the LSM grapheme-set. In this chapter issues related to the writing of LSM sign and sentence are considered. In Section 9.2 of this work the formation of LSM SW words is discussed. The vertical and horizontal layout for the writing of LSM is discussed in Section 9.4. Issues regarding the punctuation for LSM are dealt with in section 9.7. The issue of SL buoys and WE classifier verbs and their written form are discussed in Sections 9.9 and 9.10.

9.2 FORMING LSM SW WORDS

In the Roman alphabet script the way of combining graphs to form words is by writing each graph linearly from left to right. For instance in written English having the glyphs <s> <a> <w> makes it possible for a specific written construction of the word 'saw'. The underlying rule is that the glyphs are to be read from left to write, i.e. first <s>, then <a>, then <w>, so that <saw> is different from <was> where the same glyphs are involved in the reverse order.

SW is a very different alphabet from that of English and Maltese (see Section 3.6). It shares some similarity with the Han'gul script for Korean, since it is an iconic alphabet. It was also discussed how the level of the phoneme is also visible and thus

cannot be void of meaning (see Section 4.2). Each visible SW glyph represents a visible feature of the sign. Furthermore the glyphs can be positioned in relation to one another in an iconic way where the position of the glyphs parallel real articulation. For example the LSM sign ALLA (GOD) is signed with the two index-hands positioned on the right side of the head. The right hand is slightly higher than the left hand:  ALLA (GOD).

Thiessen (2011) described the formation of SW. One of his first remarks regarding the positioning of glyphs to form a word is as follows: "The iconicity prevalent in SignWriting provides some guidance" (Thiessen, 2011, p. 186). As was seen in Chapter 2, SW glyphs are iconic of the hand configurations, head and facial expressions, and movement arrows that parallel real-life movement, and this reality in itself guides the writer when he is placing glyphs in relation to each other to form a word.

Thiessen (2011) also talks of Sutton's preference for the order of glyphs. This preference is as follows: the handshape is written at the location of the onset of actual sign it represents. In a LSM sign such as NAF (KNOW) the Index handshape starts at the forehead and moves slightly up/slightly forward. In such a sign the SW recommendation (Section 2.9) suggests that the handshape glyph is positioned at head-glyph and that the movement arrow is positioned in relation to the handshape

glyph to iconically represent the path of movement the handshape will take:

 NAF (KNOW)

Sutton's recommendation is described in Section 2.9. The second part of the rule suggests that the hands are written at the location of the onset of the sign. Corina and Knapp (2006) suggest that the elements in words and signs that are first recognized may be more important for word recognition than other elements. In fact in the word boundary studies for sign language (Section 3.11) it was seen that in the misperceptions of signers reproducing nonsensical BSL signs, the location parameter was the least affected (Orfanidou et al, 2009, p. 311). This implies that the location parameter plays a crucial part in word recognition of SL.

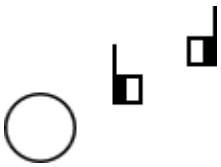
Sutton's second SW writing recommendation of SW handshape position at the onset SW location (when no contact is involved, see Section 2.9) followed by the path movement seems to be line with major sign linguistic phonological models (Brentari, 1990, 1998; Sandler, 1989). When writing LSM SW words it is recommended that the SW handshape is positioned at the onset SW location, and the SW movement is positioned close to the SW handshape in a way that shows the handshape path that is to follow (see also Section 10.8.4).

9.2.1 The relative positioning of SW glyphs

In Section 9.2 it was discussed how SW is phonetic and iconic. SW is a very flexible system of writing, where the positioning of glyphs fluctuates depending on the

articulation of each sign. The glyphs can be positioned further apart from each other as can be seen in the example below:

ALLA (GOD) (1)



ALLA (GOD) (2)

So which spelling is the best representation of the LSM sign ALLA (GOD)? The first suggestion given here is to write glyphs as close to each other as possible. 'Close as possible' means not too close to each other to represent contact, unless of course the representation of contact is intended as in the sign NAF (KNOW)  , and not too far from each other as to misrepresent the LSM nominal morpheme of SIZE-INCREASE. The relative positioning of glyphs results in a difference of meaning due to the SIZE-INCREASE morpheme e.g. MEJDA (TABLE) vs. MEJDA-KBIRA (LARGE-TABLE).

This phenomenon found in SW has no parallel in any other known written language. In SW the relative space between symbols may be symbolic and representative. In the example below there are two different signs that are identical in all aspects except for the relative space between the two hands. This shows that the space itself may be considered to be meaningful, resulting in different signs. The first meaning KAXXA-ŻGĦIRA (SMALL-BOX) the second meaning KAXXA-KBIRA (LARGE-BOX).

	
KAXXA-ŻGĦIRA (SMALL-BOX)	KAXXA-KBIRA (LARGE BOX)

A further question asked here is about the readability of these two signs? Can the space between the glyphs register as a symbol to the reader? Can the reader *read* the relative distance between the above two signs or is the relative empty space between the glyphs not graphical and thus not symbolic? If the empty space is not a symbolic marker, then what may be used in SW to mark the relative space between glyphs? This could be a subject for future research.

9.2.2 LSM spellings that differ in positioning of glyphs

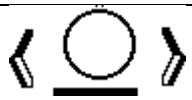
In the LMAP there are spellings of LSM signs that differ in the positioning of glyphs in relation to one another. The reason for this is the flexibility of SW discussed in Section 9.2.1. Most SW glyphs (e.g. handshape and movement arrows) can rotate 360 degrees (see Section 2.6), so there are slight variations in the angle of the glyph. Other variations include the relative distance between each other (discussed in Section 9.2.1).

Another reason why SW spellings differ is because of other glyphs used in the spelling. For instance an arrow glyph can be placed right on top of a handshape glyph. However, if another glyph has already taken that position the arrow glyph will be placed elsewhere.

To illustrate the reasons for variation in the spellings of a sign, an example is given in Figure 9.1. Here there are three spelling variations of the LSM sign ANĠLU (ANGEL). Spelling 1 does not have the knuckle-joint movement glyph, spelling 2 contains the knuckle-joint movement rotated in one position, and spelling 3 has the knuckle-joint movement rotated in a different position. It can also be seen that spelling 2 and 3 vary a little because the handshape glyphs are further away from the head glyph in spelling 3. This happens because the position of the knuckle-joint movement in this spelling takes up more space.

There are three different spellings of ANĠLU (ANGEL) (Figure 9.1) because during the process of writing the writer would include different phonetic details in written form. However for readability purposes it might be better to maintain just one form in order for the sign to be accessed more easily. This also applies for the examples in Figures 9.2 and 9.3.

Figure 9. 1: LSM Variant spellings of ANĠLU (ANGEL)

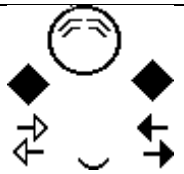
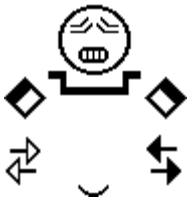
	ANĠLU (ANGEL)
1.	
2.	
3.	

Thiessen (2011) carried out in-depth work about the rules of SW when combining glyphs together. It is not the intention within the scope of this work to restate all that has been done by Thiessen (2011).

As with all signs related to emotions, the LSM sign BIŻA (FEAR) may vary a lot. Emotion is a gradient, so the degree of intensity of the emotion may show up in facial markers. The facial markers change depending on the intensity of the emotion. In Figure 9.2 spelling 2 the 'fear' expressed is more intense than in spelling 1 and this can be noticed from the glyphs on the face. The question is whether the different facial expressions make it difficult to retrieve the common part of the spelling BIŻA (FEAR). If all other glyphs remain constant, then the common part of the sign BIŻA (FEAR) would be read and the differences in facial expression would be read as a modification to the sign BIŻA (FEAR) meaning different intensities (ĦAFNA (A LOT) vs. IMMENS (EXTREMELY).

In Figure 9.2 the other glyphs do not remain constant. There is a difference in palm orientation between 1 and 2. The difference is merely phonetic, however the recommendation is that the orientation of the handshapes in part of the sign BIŻA (FEAR) remains constant.

Figure 9. 2: LSM spelling variants of the sign BIŻA (FEAR)

	BIŻA (FEAR)
1.	
2.	

Another example of variant spellings found in the LMAP is of the sign TARBIJA (BABY), Figure 9.3. TARBIJA (BABY) spelling 1 is very different from 2 and 3 primarily because spelling 1 includes the arm glyphs that are not included in spelling 2 and 3.

Figure 9. 3: LSM spelling variants of the sign TARBIJA (BABY)

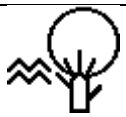
	TARBIJA (BABY)
1.	
2.	

3.	

The LSM spellings for the sign META (WHEN) are various, though at times very slight differences. In Figure 9.4 it can be seen that spellings 1, 2, 3, 4 vary from the spelling in 5 and 6 on the basis of the chin symbol inserted in 1, 2, 3, and 4 and omitted in 5 and 6. There are slight spelling differences in the positioning of the SW glyphs, where for instance in 5 and 6 the finger movement symbols are placed to the side rather than on top of the hand symbol. Also the finger movement is placed to the right side in 5 whereas in 6 it is placed to the left of the handshape. One final difference is the rotation of the finger movement glyph where in spelling 4 this glyph rotated differently from the others.

Figure 9. 4: LSM spelling variants of the sign META (WHEN)

	META (WHEN)
1.	
2.	

3.	
4.	
5.	
6.	

9.2.3 Deaf feedback regarding LSM variant spellings

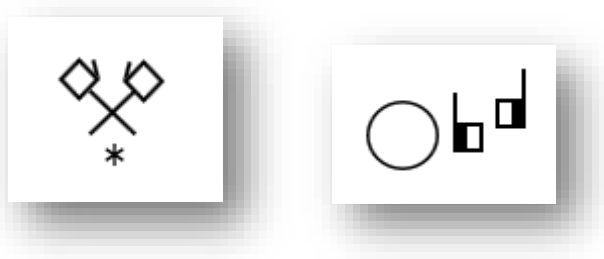
The variant spellings shown in Figures 9.1 to 9.4 were presented in Exercise 3 of the reading-questionnaire (Appendix C) in order to receive any feedback about this area of SW. There was a lot of variety in the preferences towards the different spellings, which indicates that there are many different ways of spelling the same sign in SW. It was mentioned by three participants that the two spellings of the sign BIŻA (FEAR) (Figure 9.2) result in different meanings (fear vs. intense fear) and thus they are not spellings of the same sign but the spellings of two different signs. Another pattern observed was the preference for the arms in TARBIJA (BABY). Here nine out of the ten participants preferred the sign with the arms glyph included.

9.3 THE SW WORD: SW-BOXES

In alphabetic writing each word is identifiable by its space from the previous and following word. Likewise in SW the spaces between signs are a cue to the beginning and end of a SW word. The Deaf readers were asked to identify the end and start of each SW word in Exercise 2 of the reading-questionnaire (Appendix C). The results indicate that the 'word' in SW is not as clear-cut as expected.

Every SW sign is written within a two dimensional 'sign box' (Thiessen, 2011, p. xxii). When using SignPuddle 2.0 (Section 8.2) the 'palette' where the SW glyphs are placed and positioned in relation to one another to form a SW sign, represents the SW sign box.

Figure 9.5: Two sign-boxes



Once a sign has been written using the chosen SW glyphs in the 'palette', it is positioned into a vertical column, or across a horizontal line, depending on the layout which is chosen.

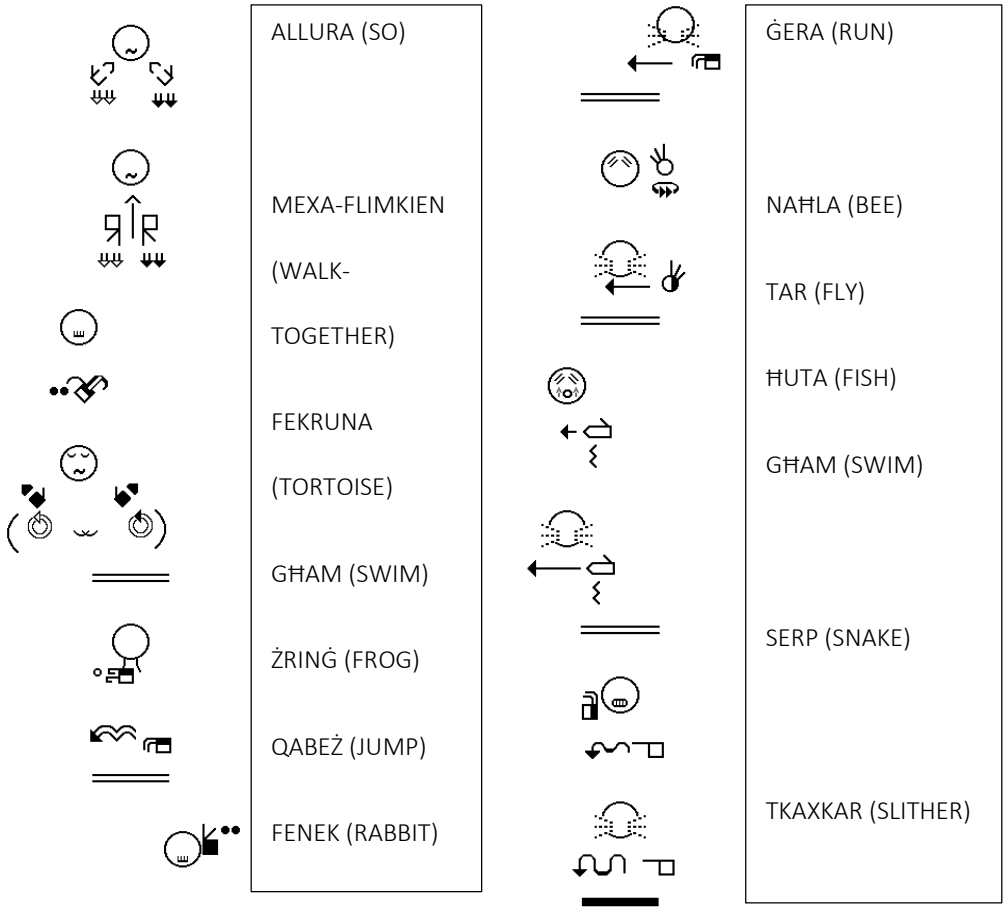
9.3.1 Deaf participants' feedback on SW word boundaries

In Section 3.11, some aspects regarding the boundary of words in both continuous speech, signing, and the written spoken word were considered. In recent years, the

segmentation and recognition of the word/sign in sign language is becoming an area of interest. SW could be used as a tool to identify whether the sign boundary can be recognized in written form.

In Exercise 2 of the reading-questionnaire (Appendix C) a sentence was given to the Deaf participants where they were asked to mark the words/signs as described in Section 9.3. The result was unexpected. Out of the ten participants, only two participants marked each SW sign/word. Two participants marked the SW text in a way that could not be interpreted. One participant did not mark the text at all. The remaining five participants marked the text beyond the sign-box level. They identified the boundaries not of words/signs but rather phrases. The sentence given can be seen in Figure 9.6.

Figure 9.6: LSM sentence (from LMAP Passigata) that was used to identify word/sign boundaries in the reading-questionnaire.



In Figure 9.6 it can be seen that the sentence was full of classifiers and classifier verbs. This may be the reason for the lack of marking of SW words, because the classifier together with its verb may be perceived as one word by some native signers. More discussion can be found in Section 9.10.1.

9.4 SW VERTICAL LAYOUT

If the vertical layout is chosen for the writing of text, the choice for each sign-box's placement in the column is either in the centre, to the left or to the right. Thiessen

(2011) describes the vertical midline as the SW 'baseline'. The 'baseline' is crucial for the understanding of how SW words are positioned across a page.

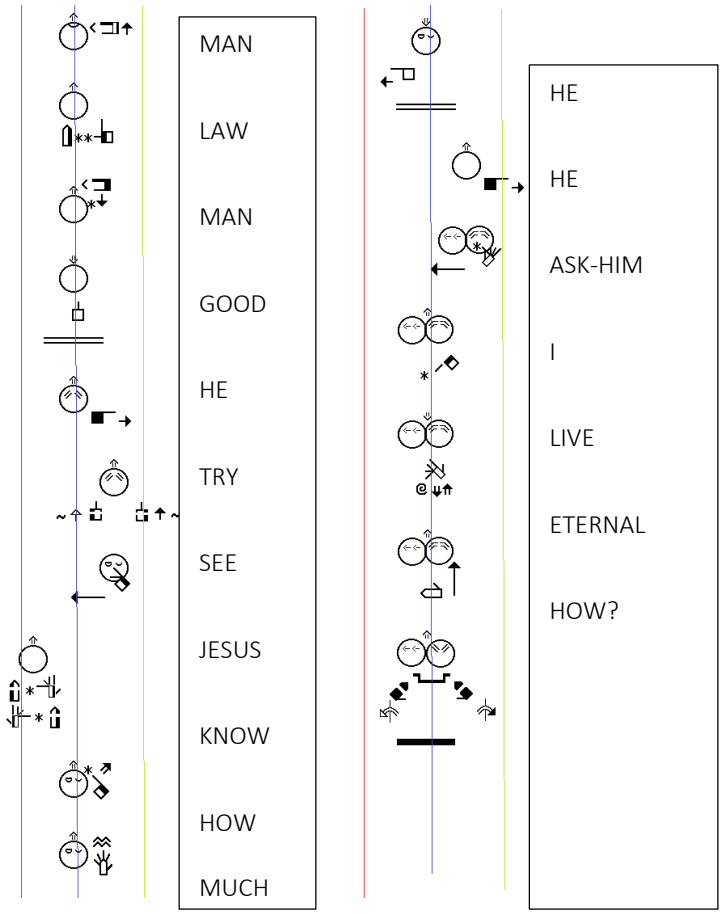
When composing a line of text writing systems generally impose a baseline that organizes the line of text. Writers using alphabetic writing systems are used to a baseline that is placed underneath the characters. Strokes within the characters may rise above or fall below the baseline, but all characters are aligned on the baseline. (Thiessen, 2011, p. 188)

Thiessen (2011) describes the vertical layout as the only SW layout available. However there are languages that prefer the use of the horizontal layout (Section 9.5). Nicaraguan Sign Language, Spanish Sign Langauge (LSE) (cf. Parkhurst & Parkhurst, 2008) and German Sign Language use the horizontal layout.

In an earlier version of SignPuddle (2011-2012) texts could be produced in a vertical layout only and this may have had an impact on the SL's choice of layout. SignPuddle 2.0 can produce horizontal text also. However, out of respect for Deaf people's preference its default setting is to create vertical text.

The vertical layout consists of sign-boxes placed in vertical alignment starting from the top left hand side to the bottom of the page. The vertical layout of SW uses a mid-line where the neutral position of the signer's body is represented by an alignment of signs along the mid-line (see Figure 9.7).

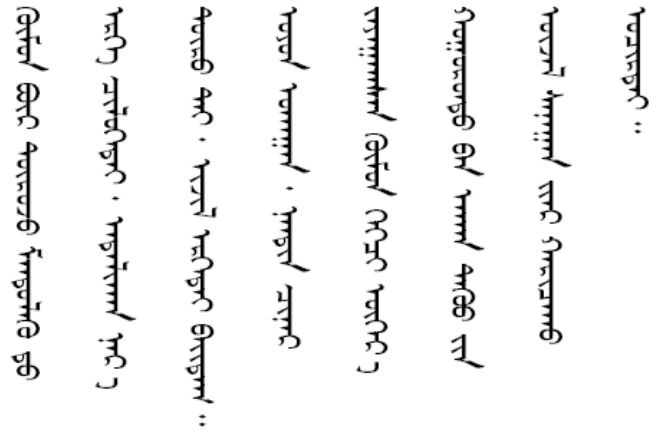
Figure 9.7 Three-lanes positioning of SW signs vertically. Translation of Luke 10:25 from LMAP 'The Good Samaritan[49]



Sign-boxes may be placed to the left and right of this mid-line, and the relative placement between sign boxes appears to be significant for spatial comparisons (Section 6.7). Thiessen (2011, p.189) compares this SW vertical baseline to the Mongolian script (Figure 9.8) baseline where the characters are also positioned vertically and are bound to a midline baseline and move to the left and right of this baseline.

[49] http://www.signbank.org/signpuddle2.0/canvas.php?ui=1&sgn=127&sid=84

Figure 9.8: Mongolian Script uses a vertical baseline. Taken from www.omniglot.com with permission from Simon Ager



All known LSM written texts are written in vertical columns. Slevinski (2012) discussed the vertical layout of SW as follows:

> Each sign of a sign language is written as a 2-dimensional cluster of symbols. Most commonly, these clusters are arranged vertically from top to bottom. SignWriting is written vertically because Deaf people requested it. Vertical writing is the world standard for writing the native sign languages of the Deaf. SignPuddle defaults to vertical writing out of respect for the Deaf Community. (...) The vertical arrangement quickly delineates the left and right sides of a sign. This obvious identification of left versus right is very important for sign language and allows for easier reading that flows more naturally. Vertical writing also allows for writing with lanes, an advanced technique needed to write role shifting. (Slevinski, 2012 taken from:

http://blog.wikimedia.org/2012/06/01/towards-a-wikipedia-for-signed-languages/#comment-114034)

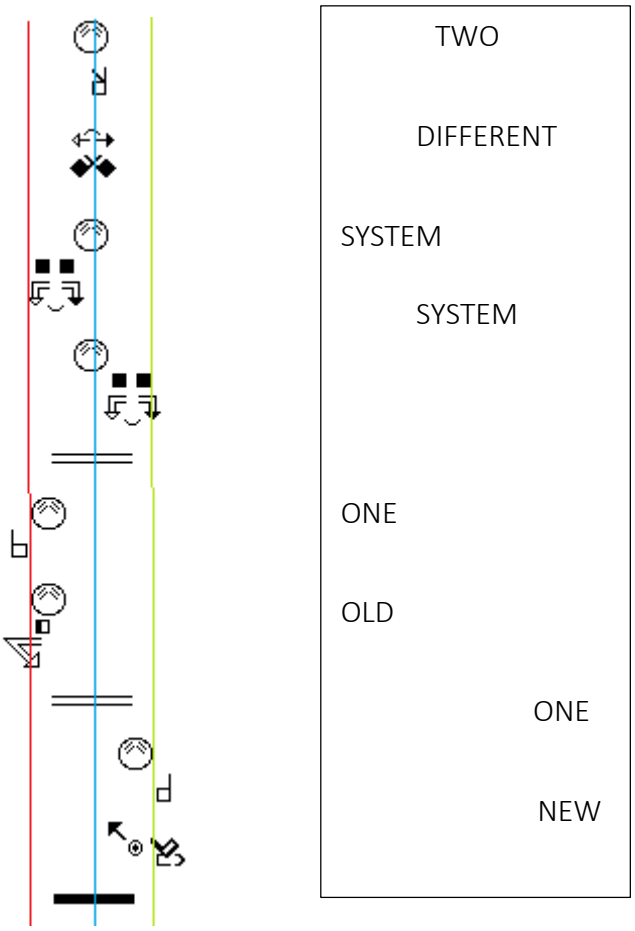
As mentioned in Slevinksi's (2012) quotation, writing vertically may provide several benefits for the representation of sign language. Thiessen (2011, p. 189) also claims that the vertical layout offers more flexibility. The vertical mid-line represents the body's natural vertical line of symmetry. Thus placing signs to the left and right side of this mid-line parallels the natural placement of signs to the left and right of the signer's body.

9.4.1 Spatial comparisons using SW

LSM spatial comparisons do not involve the shifting of the body to the right and left (Section 9.4.2). Rather the hands of the signer producing the signs are placed to the left and right contrastively (see Figure 9.9).

The ASL SW text below (Figure 9.9) is taken from an SW Lesson (Van Hoek & Sutton, 1998, p. 7). It is a piece of SW text that describes spatial comparisons. It was produced by Karen Van Hoek. Although Sutton has never claimed that vertical writing is obligatory, lessons such as these on spatial comparisons may have led to the widespread belief that the vertical layout is fundamental.

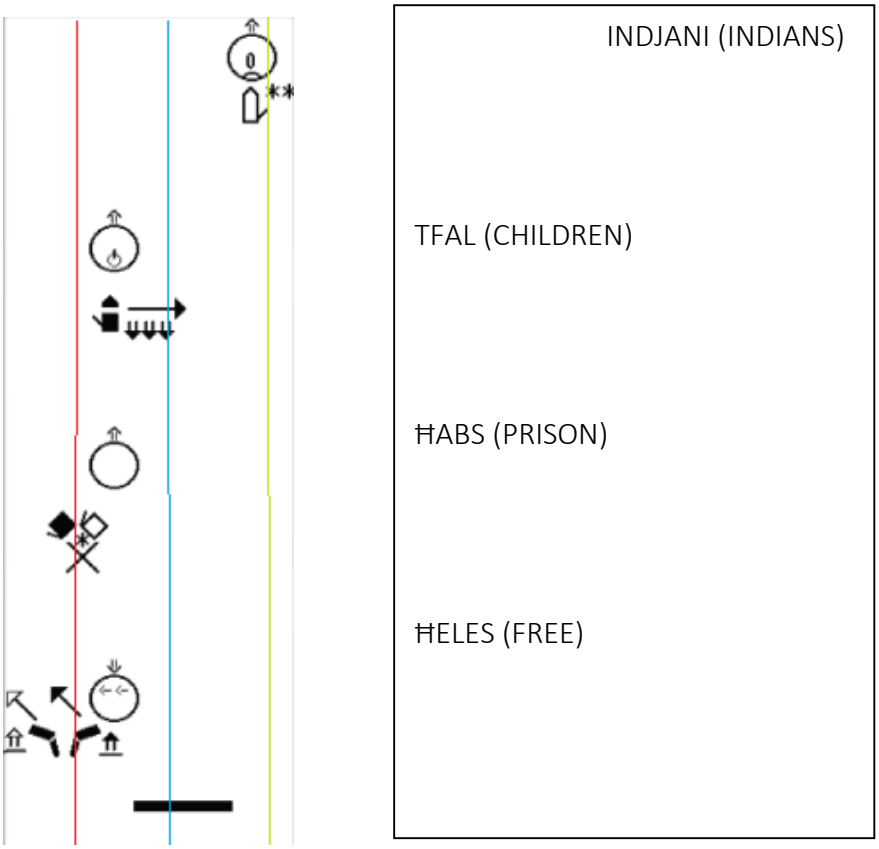
Figure 9.9: ASL example of spatial comparisons taken from Van Hoek & Sutton, 1998, p. 7).[50]

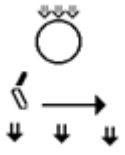


In the LMAP writing using the three lanes for spatial comparison can be found. For instance in Figure 9.11 and Section 6.7.

[50] The English translation of the above excerpt shown in Figure 9.9 is: "*Two different systems, one old and one new*". (Van Hoek & Sutton, 1998, p. 7). In this example two systems are under discussion, an old one and a new one. The writer placed the old system to the left lane, and the new system to the right. The gloss is: TWO DIFFERENT SYSTEM. SYSTEM. ONE OLD ONE NEW.

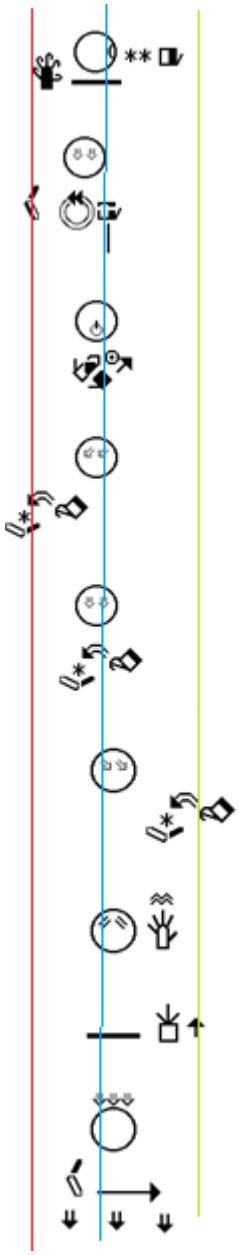
Figure 9. 10: Placement of INDJANI (INDIANS) on the right lane and TFAL ĦABS on the left lane for later comparison or reference. (Taken from the LMAP "Peter Pan 20")



However sometimes choice was made not to use the three lanes but to incorporate these signs into one modified sign. In the LSM story *Nokklasafra (Goldilocks*) found in the LMAP where three different bear sizes are compared, the use of the three-lanes to bring about spatial comparison was used only once (BOWL-1, BOWL-2, BOWL-3). Rather than lanes, it can be seen in Figure 9.6 that the representation of these three distinct bowls is carried out in one sign  . Although the three bowls were each placed on a different SW lane (see Figure 9.11), the SW

contrasting positions of left, right and centre in the SW lanes were not used later in the text for referencing.

Figure 9. 11: Three-lane positioning used for spatial comparisons from LSM Nokklasafra.



MAMA'ORS (MOTHER BEAR)

DAWWAR-BORMA (STIRRING)

LESTA (READY)

BAWL-xellug (BOWL -left)

BAWL-ċentru (BOWL- centre)

BAWL-lemin (BOWL-right)

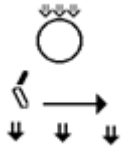
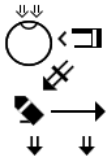
KEMM? (HOW MANY?)

TLIETA (THREE)

BAWL,BAWL-BAWL (BOWL-

BOWL- BOWL)

Another example of a spatial comparison being made without vertical layout, is found in the LSM data of the translation of the Prodigal son in the LMAP. Here the two sons were represented in written form not vertically in different lanes but in the

same way that the bear's bowls were written in Figure 9.11  . Here the two sons are spatially compared without the space that is created by a vertical layout:  [51] IBEN-1, IBEN-2 (SON-1, SON-2) (see also Section 6.3 example 27). Once again here a spatial comparisons may be represented without vertical alignment of sign boxes, but rather through the SW word (see more Section 6.7).

9.4.2 Role shifting and overlapping pronominal affixing

Unlike spatial comparisons (Section 9.4.1), body shifting in LSM occurs when the manual sign including the shoulders/body shifts to the left or right. This is also known as role-shifting where the signer takes on different roles by shifting body to the left and right contrastively.

It has been claimed in SW literature that the vertical baseline creates the possibility of representing body shifting in written form (Thiessen, 2011, p. 190). Body Shifting is a linguistic device in SL where the shoulders or the whole body moves to the left or the right in order to establish different characters in a discourse.

However, Nancy Romero, author of the ASL SW New Testament (see Appendix A), uses an additional marker to write role-shifting. This includes the shoulder glyph tilted to the left or right according to need (see Figure 9.12 circled signs). The first

[51] http://www.signbank.org/signpuddle2.0/searchword.php?ui=1&sgn=147&sid=19,21,23,44,45,46,47,48,49,50,51,52,53,55,56,57,58,59,60,61,62&sTrm=Iben&type=any&sTxt=&sSr

circled sign includes the shoulder shifting to the right , this is Saul talking to God/Christ. In the second circled sign the shoulder shifts to the left which indicates the response from God being directed to Saul. This may imply that vertical positioning is not enough to mark role-shifting in SW.

Figure 9. 12: Romero's writing of part of Acts 9:5. The SW sign circled on the left column shows the shoulder-shift representing a body shift of the character Saul asking a question. The SW sign circled in the right column represents a shift that marks the discourse of another character, Jesus.

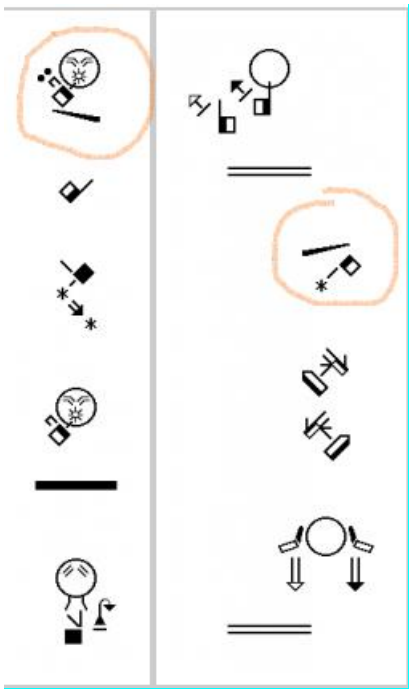
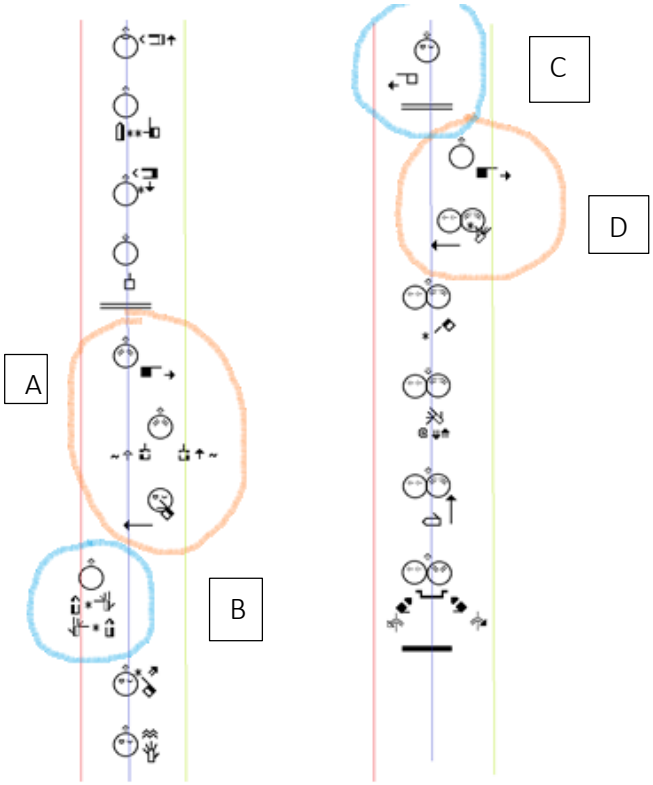


Figure 9.13 shows a SW LSM sentence taken from the translation of the Good Samaritan found in the LMAP. Here not only is role-shifting represented by use of the lanes, but furthermore the lanes are used to write pronominals (3rd person right vs. 3rd person left) and even an agreement verb.

For instance, the sign ĠESU' (JESUS) was positioned on the left (circled and labelled B.), whereas the 'Man of the Law' was placed on the right (circled and labelled A.). So when the 3rd person pronoun DAN (HE) was written, the index handshape glyph was directed towards the left lane in order to refer to JESUS (see circle C in Figure 9.13). When an agreement verb is written, SAQSA (ASK) (see circle D.), the arrow of the verb is directed to the left lane in an attempt to 'inflect' it to 3rd personal pronoun established on the left lane, i.e. JESUS.

Figure 9.13: Three-lanes positioning of SW signs vertically. Translation of Luke 10:25 from LMAP 'The Good Samaritan[52] *(for glosses see Figure 9.7)*



[52] http://www.signbank.org/signpuddle2.0/canvas.php?ui=1&sgn=127&sid=84

As seen in Sections 6.5 and 6.6 the SW LSM pointing signs are ambiguous. Thus a more thorough analysis of LSM pronominals including agreement verbs and their writing was carried out in Chapter 10.

9.4.3 Discussion: Vertical positioning of signs in lanes –A requirement or option?

ASL interpreter and SignWriter Nancy Romero has produced the largest amount of texts in her ASL translation of the NLT[53] Gospels (see Appendix A). She believes that writing vertically may be significant for the representation of spatial comparisons. When asked about her opinion about 3-lanes for the representation of ASL, she commented as follows:

> Having 3 lanes helps keep people/groups/places where they are, until you change them. The shifting (to another lane) can be slight, but this reads much more clearly in a column of written sign, especially when there is "pointing" to the lanes. (Romero, N., February 2013, personal communication)

However, even though evidence shows that the spatial positioning in vertical columns may help signal spatial comparisons, the Nicaraguan project challenges the widespread notion that vertical writing is more fully representative of SLs than horizontal writing. James Shephard-Kegl and his team have produced a large amount of SW books in Nicaraguan SL (see Appendix A). When questioned about

[53] New Living Translation

any difficulties encountered when representing the Nicaraguan Sign Language using the SW horizontal layout his comment was the following:

> I see no advantage to writing vertically other than being different for the sake of being different (from English). I have never encountered any difficulty in writing horizontally (left to right). Rather, this enables me to write compounds without any problem. (CHILD-MALE for BOY, for example). Or, signs for various types of dinosaurs (long fingered flying reptile, for example). I always use the old JAVA software, so writing horizontally is not an issue. Also, when the question of switching to vertical came up, the Deaf students in the class in Bluefields at that time did not want to change. (Shephard-Kegl, Feb 2013, personal communication)

These two contrasting attitudes towards 3-lane writing and the representation of SL leads to the speculation that perhaps lane writing is a stylistic feature rather than a necessity. In fact Romero (2013) states that using lanes "reads much more clearly in a column of written sign of SL", which signals that without lanes the text may still be read but not with such clarity. Further evidence that points to the use of lanes as optional and stylistic rather than obligatory comes from the revised spellings of pronominals (see Appendix H).

In the same way that the shoulder/body symbol and its relation to other symbols is fundamental for the representation of pronominal affixing in LSM (see Section 10.5), likewise the body symbol in relation to the hands+movements

offers another representation of LSM spatial comparisons, where the position of the signing to the left and the right is brought about in the relationship between the SW glyphs.

Valerie Sutton (2011) is aware of the function of the body and trunk for the representation of sign languages. She notes that these glyphs (and not simple vertical positioning to the left, right and centre) “are used in Sign Languages as a part of grammar, especially when describing conversations between people, called Role Shifting, or making spatial comparisons between items on the left and items on the right.” (Sutton, 2011, p. 20).

The hypothesis held here is that with the inclusion of the shoulder glyph that represents the body and having handshape and movement glyphs written to the left and right of the shoulder glyph, LSM spatial comparisons may be represented without the use of the vertical lane. This appears to be the case for the regular spellings found in the ASL Bible (Section 9.4.2) to mark role-shifting. Since the spellings of body-shifts are so regular and clear, the vertical positioning of signs seems to be redundant. Regular spellings such as the shoulder-tilt for role-shifting in the ASL Bible may explain how Nicaraguan Sign Language has managed to produce such a large library of written resources using the horizontal layout of SW.

Furthermore it is hypothesised here that when the spellings of signs are still in the early phases and do not contain enough markers to represent body-shifting/role-shifting, spatial comparisons and pronominals then vertical positioning of signs may help to disambiguate between similar and unclear spellings.

9.4.4 Is the vertical positioning of signs graphemic?

It is further questioned here whether the positioning of signs to the left and right of the mid-line can be perceived by readers as graphemic. When reading SW text does the varying alignment (a patterned absence of text in vertical alignments) register as a grapheme and thus meaningful in a reader's mind? Are these patterns of vertical spacing clear enough to be symbols at all? This question is not investigated at any further length here but would be interesting to pursue in future research.

9.4.5 SW Horizontal layout

In the early days of SW ASL the horizontal layout was used. ASL SW evolved from this horizontal layout to a vertical layout. This was a natural shift that was suggested by the Deaf community using the writing system, who felt that it was more natural to write vertically in order to show spatial relationships (Sutton, personal communication, 2010).

Older ASL SignWriting texts, i.e. those produced before the 1990s, have used the horizontal style of writing mainly because this was the only way SW could be created in the existent program of the time, the SignWriter DOS (Adam Frost, personal communication, June 2012).

In a horizontal layout the SW word is still composed in a SW sign-box where the glyphs are placed in relative position to one another. However, rather than placing each sign box in vertical position to one another across the midline, in a horizontal layout the sign-boxes are placed next to each other on a horizontal plane.

It is generally thought that when using the horizontal layout the SW loses its potential to write spatial comparisons and other grammatical forms. Slevinski (June 2012) claims "some grammar details are lost in Horizontal Writing"[54] . Some arguments against these ideas can be found in Section 9.4.3. Additionally the numerous Nicaraguan Sign Language stories that have been written using the horizontal layout challenge the general idea of non-representation of SL grammar using horizontal SW. The large amount of Nicaraguan stories calls for an analysis into what SW markers of this language represent spatial comparisons, body shifts and grammatical meanings. Shepard-Kegl's (2013) choice for using horizontal layout is primarily because of their use of the computer program SignEdit (Shepard-Kegl, 2013, personal communication). However when questioned whether he ever found difficulty in representing the Nicaraguan Sign Language using the horizontal layout, his answer was negative (Shepard-Kegl, February, 2013, personal communication).

9.4.6 Deaf feedback: Vertical & horizontal LSM layouts

In Table 9.1b the results of preference for vertical and horizontal layouts of SW of LSM are presented. Only two participants preferred the horizontal layout. Four out of the ten participants preferred a vertical layout and another four thfound both vertical and horizontal layouts equally acceptable.

[54] (Slevinski, 2012, http://blog.wikimedia.org/2012/06/01/towards-a-wikipedia-for-signed-languages/#comment-114034)

Table 9. 1b: Presentation of Deaf participants' preference for vertical or horizontal layouts for LSM

	1	2	3	4	5	6	7	8	9	10
Vertical			X	X	X	X				
Horizontal									X	X
Equally acceptable	X	X					X	X		

Participant 1 said that both layouts were acceptable and that the horizontal layout could be used as subtitles. This participant added that using the horizontal layout may be useful since the Maltese and English scripts are horizontal also. Participant 4 said that the vertical layout is better because it can display the movement more clearly as there is more space to do so.

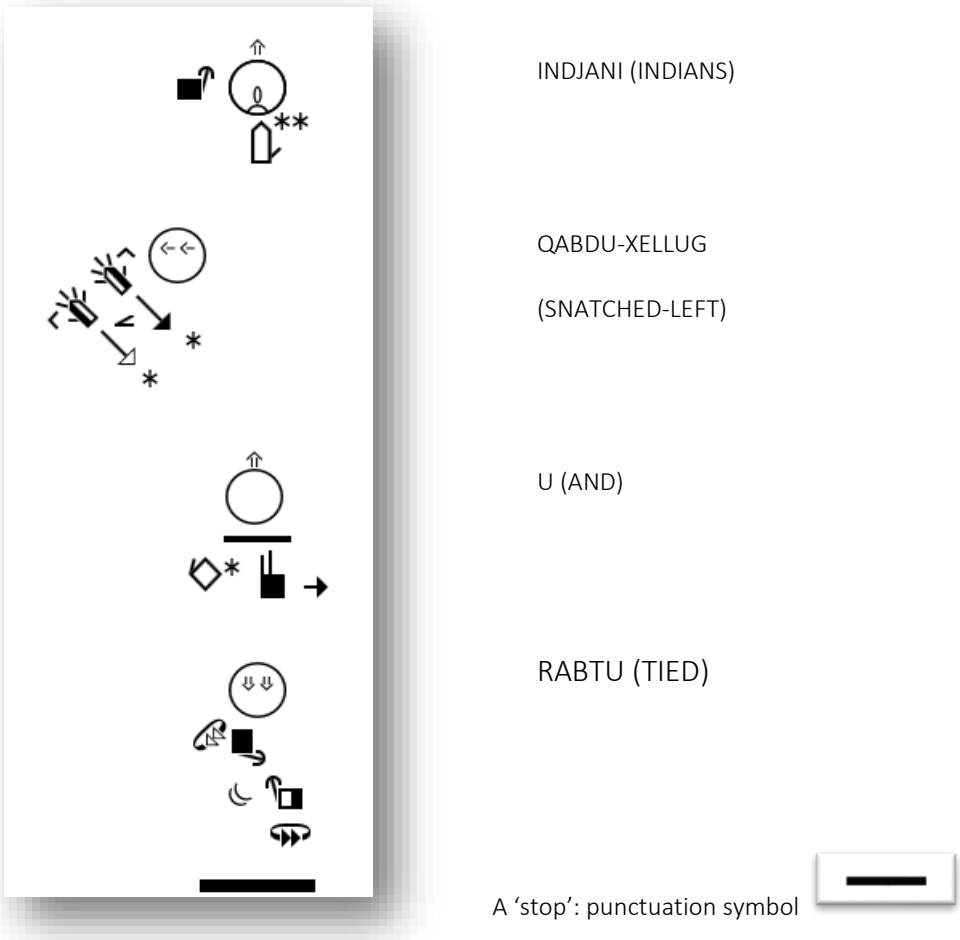
Participant 6 said that the vertical layout was preferred because it could display locations more clearly. Participant 7 said that both layouts were equally acceptable and that preference would depend on what the reader learnt first and what the reader is used to. Participant 8 said that both layouts were acceptable but would be used differently. The horizontal layout could be used for landscape paper layouts and the vertical layout for A4 paper layouts.

9.7 PUNCTUATION AND PROSODY

Thiessen (2011, p. 173) describes punctuation glyphs as occupying their own sign boxes that he calls "punctuation boxes". This claim describes Sutton's recommendation for SW, however in LSM written texts the punctuation glyph is often included in the sign box of the final SW sign.

Thiessen also states that the punctuation sign box is always placed on the mid-line. In LSM SW data the punctuation glyphs are often written right beneath the last sign in the sentence, irrespective of whether that final sign is on the midline, to the left or right, as can be seen in Figure 9.14 taken from Peter Pan in the LMAP.

Figure 9. 14: Example of punctuation symbol inserted under last sign to the right of the midline in an LSM sentence taken from Peter Pan 11 in the LMAP.



The only punctuation glyphs found in the LMAP are the stop  and the pause glyphs. One reason for this is that many times questions are marked by head-tilts discussed in the next section (Section 9.7.1).

9.7.1 Head tilts to mark prosody vs. punctuation

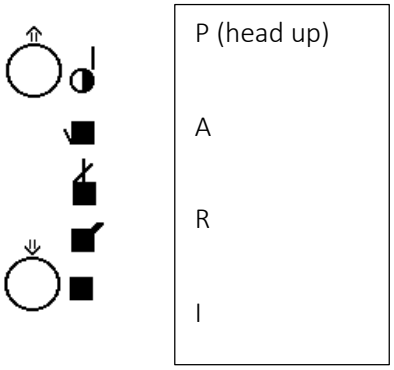
In the LSM data head-tilts are widely used (See Section 6.8). The head-tilt glyphs can be seen marked in Figure 9.15. The glyphs for head tilts were included in the text, because it was understood that head-tilting marks prosody in LSM. It was observed how different patterns of head-tilts marked different prosodic structures. A head-tilt up-up-down marks a statement. A head-tilt down-down-up marks an open-ended question.

Figure 9. 15: Head-tilts seen circled in red from a sentence in the LMAP (part of Luqa15v7) translation: ĠENNA L-ISTESS, MITT PERSUNA, (HEAVEN SAME, ONE HUNDRED PEOPLE)

The inclusion of head-tilts in the LSM texts was motivated by a discussion that was held on the SW List about the head-tilt patterns that would accompany a fingerspelt word. The following had been noted by Charles Butler[55] (see Figure 9.16).

In Figure 9.16 the head starts tilted upwards on the 'P'. It remains tilted upwards throughout 'A, R, I'. Finally the head comes down on the 'S', closing the unit of fingerspelling.

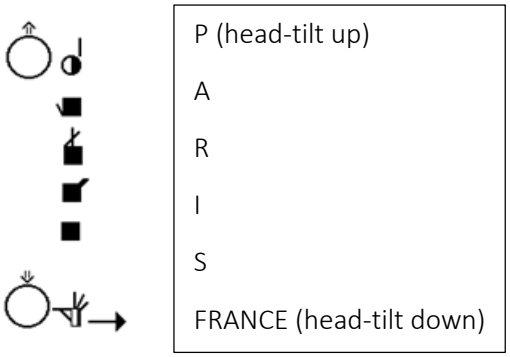
Figure 9.16: Head-tilt pattern UP-DOWN accompanying a fingerspelt word.



Additionally when the fingerspelling clause ended with a sign, for example P.A.R.I.S FRANCE the final head-tilt down would occur on the sign FRANCE and not on the last letter of PARIS (see Figure 9.17).

[55] Charles Butler is a regular contributor to the SW List.

Figure 9.17: Head-tilt pattern UP-DOWN accompanying a fingerspelt word plus final sign-name.



This phenomenon described for ASL also occurs in LSM. Furthermore the head-tilt up-up-down sequence of head-nods seems to be used consistently in LSM to mark the beginning and end of statement utterances. There appears to be a difference between statement patterns and question head-tilt patterns in LSM. In close-ended questions, e.g. GĦADA TAF XITA? (TOMORROW KNOW RAIN?) *(Will rain tomorrow?*), the head-nod pattern is UP-UP-UP (Figure 9.18).

Figure 9.18: A close ended question in LSM with head-tilt pattern UP-UP-UP

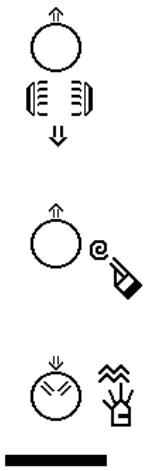
GĦADA (TOMORROW)

TAF (KNOW)

XITA (RAIN)?

In open-ended questions, e.g. ĦOBZ FLUS KEMM? (BREAD MONEY HOW-MUCH?) (*How much does the bread cost?*) (Figure 9.19), the head-tilt pattern UP-UP-DOWN is used. Thus open-ended questions seem to have the same head-tilt pattern as statements in LSM. This implies that other markers are involved in distinguishing between an open-ended question and a statement, possibly the facial expressions. This however is not further investigated in this work.

Figure 9.19: UP-UP-DOWN pattern of head- tilts in an open-ended question in LSM



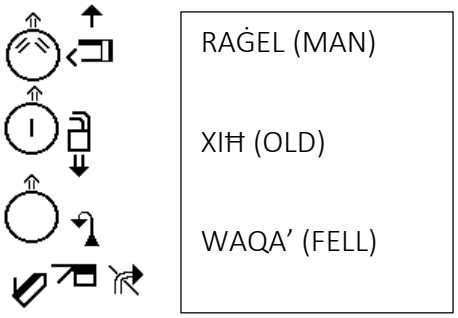
ĦOBŻ (BREAD)

FLUS (MONEY)

KEMM (HOW MUCH?)

Finally another head-tilt pattern was observed for LSM exclamations. RAĠEL XIĦ WAQA' (MAN OLD FALL). This pattern is also UP-UP-UP (Figure 9.20). Again this indicates that the distinction between close-ended questions and exclamations is not marked by head-tilts alone but requires additional markers such as facial expressions.

Figure 9. 20: Head-tilt pattern UP-UP-UP in an exclamation in LSM writing.



It is suggested here that punctuation glyphs should suffice and head-nods are redundant when it comes to reading LSM text. From observations of the Deaf participants reading the LSM texts in the LMAP it was noticed that these head-tilts were generally ignored and it made no difference if they were included or excluded in the text.

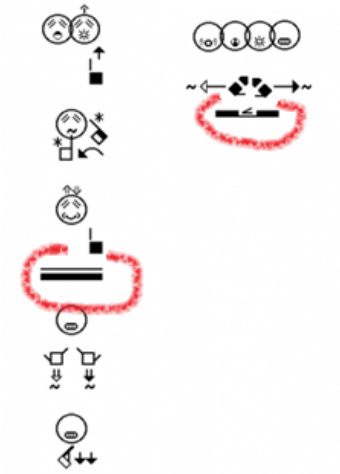
Additionally there is a practical problem that arises when including head-tilts in the LSM text. In order to add these prosodic markers in the LSM text, the head glyph is required to be written in every spelling of the text and often this head glyph is not necessary for the spelling of the sign. In Figure 9.20 the sign WAQA' (FALL) does not require the head glyph in the spelling of the word, however if the head-tilt is to be included then naturally so does the head-glyph. This would make the writing of LSM

more cumbersome and less efficient since in every single sign written the head glyph would have to be included.

Although the LSM texts have used only stops and pauses as punctuation glyphs, other sign language texts have used more glyphs. Romero made use of a few more punctuation glyphs from the ISWA 2010, for the translation of the NLT New Testament into SW ASL. Besides the stop and pause, Romero has used the SW glyphs that are equivalent to an exclamation mark . Romero states that questions are not marked by punctuation glyphs but rather by the facial expressions or by the signs that indicate that it is a question. German Sign Language has used the question mark glyph  and the exclamation glyph  (Stefan Wöhrmann[56], personal communication, March 2013) (see Figure 9.21).

[56] Stefan Wöhrmann is a regular contributor to the SW List and a teacher for Deaf students in Germany who uses SW to teach his students.

Figure 9.21: German Sign Language, with question mark and exclamation glyph in SW (encircled here). SW example courtesy of Stefan Wöhrmann.



9.7.2 Deaf feedback on prosodic markings in LSM text

In the reading-questionnaire, Exercise 5, the Deaf were asked about their preference for text with or without head-tilts that marked prosody of LSM. The results of the responses to Exercise 5 (Appendix C) can be found in Table 9.2.

Table 9. 2: Deaf participants' preference for the inclusion or exclusion of prosodic head-tilt markers in LSM writing

	1	2	3	4	5	6	7	8	9	10
Prosodic Head-Tilts	X		X	X					X	
No Prosodic Head-tilts		X			X	X	X	X		X
Equally acceptable										

Six out of the ten participants prefer the LSM texts without the prosodic head-tilt markers. On the basis of this result and from observations of Deaf participants reading the texts it is concluded here that for the writing of LSM the prosodic head-tilt markers are not required.

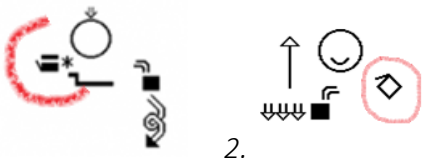
9.9 LSM BUOYS IN WRITTEN FORM

Liddell (2003b) coins the term 'buoy' to refer to the non-dominant hand hold that he observed in ASL. He describes a 'buoy' as follows:

> Signers frequently produce signs with the weak hand that are held in a stationary configuration as the strong hand continues producing signs. Semantically they help guide the discourse by serving as conceptual landmarks as the discourse continues. (Liddell, 2003b, p. 223)

In Section 4.2.2 literature concerning the simultaneity of sign languages was reviewed. Since SL can and often does make use of two hands, one hand can remain stationary while the other is moving. When signing classifier phrases this happens very often. When reading *Ġakki u s-Siġra tal-Fażola (Jack and the Beanstalk),* from the LMAP one Deaf reader said that the stationary classifier hand that remained in place over the following sign (Figure 9.22, no.1) should be removed.

Figure 9.22: Stationary hands from previous handle classifier verb (hold-bag) remain in written form in the following signs. (1. BAG ON SHOULDER COME DOWN BEANSTALK and 2. BAG IN HAND WALK ALONG) 1. Taken from Gakki2. Taken from Barnuza12.



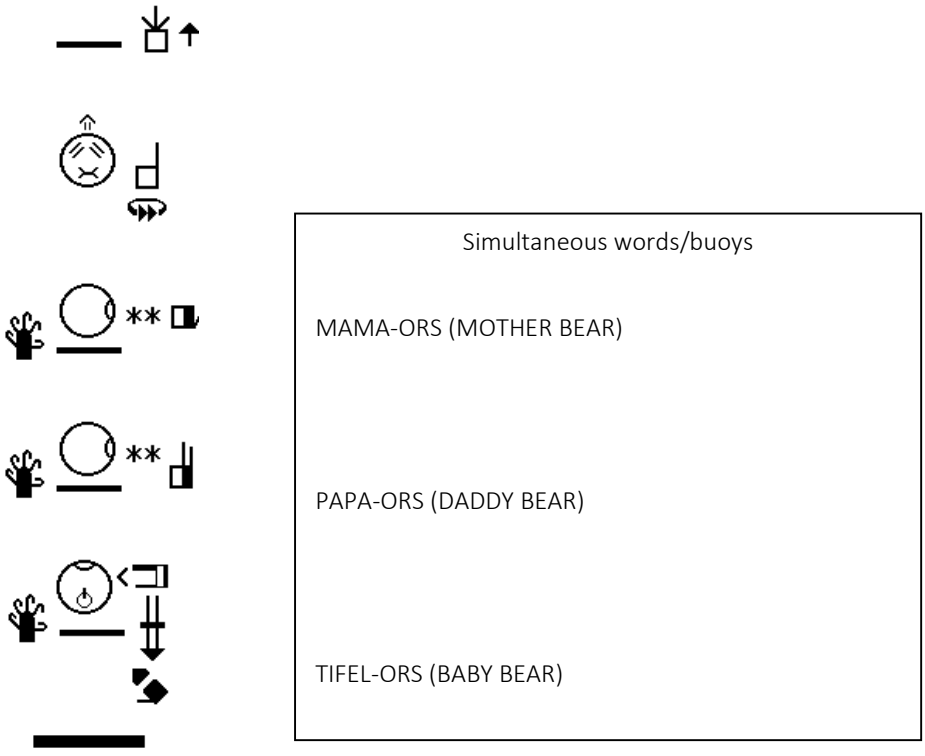
1. *2.*

Liddell (2003b) claims that this non dominant hand also happens to signal the same lexical unit that was previously signed, and may act as a semantic landmark. This may be partly the reason for the Deaf reader's preference since this would mean

that one written word would contain two lexical units. The non-dominant buoy left in place during the signing of COME-DOWN BEANSTALK is encircled in Figure 9.22, no. 1. The question raised here is what constitutes a word in LSM? In the written form is the removal of these non-dominant hand holds preferred? This question was asked in Exercise 4 of the reading-questionnaire (Appendix C).

Another example of simultaneous SW words is found in *Nokklasafra* (*Goldilocks)* found in the LMAP (Figure 9.23).

Figure 9.23: Simultaneous signs taken from Nokklasafra (Goldilocks) in the LMAP



9.9.1 Deaf Feedback on the writing of buoys in LSM

Exercise 4 of the reading-questionnaire questioned preference concerning the writing of buoys in LSM writing. In this section results of the preference of the Deaf participants regarding the writing of non-dominant hand buoys are given.

Table 9. 3: Deaf participants' preference regarding the inclusion or exclusion of buoys in LSM spellings

	1	2	3	4	5	6	7	8	9	10
Buoys Included in SW			X	X		XX			X	
Buoys Excluded in SW	XX	XX	X	X	XX			XX	X	XX
Equally acceptable							XX			

Participant 6 preferred the inclusion of buoys in writing. Participant 7 claimed that the sentences that included the buoys were acceptable but more complex and thus of a more advanced level of reading than the same sentences that excluded the buoys in writing. Both participants 6 and 7 considered buoys to be an important part of LSM.

There are more responses that marked preference for the exclusion of the buoys in LSM writing. There were 13 responses in favour of the exclusion, 5 in favour of the inclusion and 2 that both the inclusion and exclusion of these buoys are acceptable.

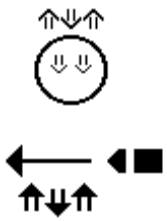
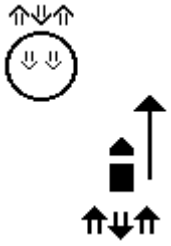
9.10 SW LSM WE CLASSIFIERS

In this section the writing of WE classifiers and classifier verbs of LSM is analysed. In Chapter 10 the writing of LSM pronominals is analysed and it will be seen how the

tense glyph in relation to the signer's body glyph results in the SW representation of different person affixes (Section 10.5).

However, the writing of LSM WE classifier verbs does not seem to require this relationship between body glyph and movement/handshape glyph. Rather in LSM a WE classifier handshape moving forward or sideways does not result in a change of meaning. This can be seen in the written form in Figure 9.24. Here two SW spellings VETTURA-TOQMOS-L QUDDIEM (VEHICLE BUMP FORWARD) result in the same meaning, i.e. vehicle bump forward. Thus, in LSM the choice between a sideway or forward SW representations appears to be completely arbitrary.

Figure 9.24: Two spellings- front and side positioning of glyphs of the classifier verb VETTURA-TOQMOS-L QUDDIEM (VEHICLE BUMP FORWARD)

VETTURA-TOQMOS-L QUDDIEM (VEHICLE BUMP FORWARD)	
	
Spelling 1	Spelling 2

Channon (2002) talks of this flexibility in SL classifiers as 'predictable iconicity' (see more in Section 4.2.3). SW allows for this flexibility of SL due to 1) the large glyph-set (see Chapter 2), 2) the possibility of rotating most glyphs 360% (Section 2.6), and 3) the freedom to place the glyphs in relation to one another in innumerable ways (see Section 2.5.1).

If however there are two WE classifier handshapes, for example VETTURA TAQBEŻ VETTURA (VEHICLE OVERTAKES VEHICLE), then the relative placement of the WE classifiers with one another is meaningful. This meaningful relative placement of classifiers is represented in SW through the relative placement and rotation of SW glyphs. The meaning TAQBEŻ (OVERTAKE) can be read whether written as spelling 1 or 2 in Figure 9.25. The spellings are both acceptable because the glyphs are visible and in both spelling it can be seen that one handshape is moving towards, and ends in front of another handshape.

Figure 9.25: Front and side positioning of classifier glyphs of a LSM spelling.

VETTURA TAQBEŻ VETTURA (VEHICLE OVERTAKE VEHICLE)	
	
Spelling 1	Spelling 2

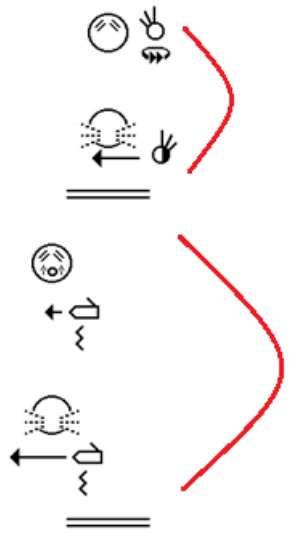
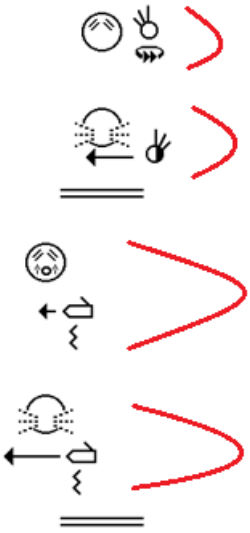
The meaning of 'forward' (in Figures 9.24 and 9.25) is thus not carried in the arrow itself, but in the relationship between the arrow glyph and the other glyphs. The SW of LSM WE classifiers also confirms the finding that the parts of LSM WE classifier handshapes carry meanings, e.g. front and back and top and under of the WE classifier (Galea, 2006). In Figure 9.25 it can be seen that the fingers side of the palm carries the meaning of 'front' of the vehicle. This phenomenon has been described for other languages, especially for ASL by Liddell (2003b) and is explained further in Section 4.5.1.

9.10.1 Deaf Feedback: WE Classifier verbs and the notion of words

Exercise 8 of the reading-questionnaire (Appendix C) was designed to collect information about the Deaf participants' view of SW WE classifiers, particularly whether they preferred sideway or forward positioning of glyphs. However Exercise 2 concerning the SW word/sign boundaries also gave some insights about the participants' perception of classifiers and classifier verbs.

Eight out of the ten participants did not mark each SW sign individually according to each sign-box (Section 9.3). Rather they marked both the WE classifier handshape created in one sign box and the following classifier verb that takes up another sign-box as one word/sign (see Figure 9.26 number 1). Perhaps the participants did not understand what was requested, but this is unlikely because the researcher gave the instructions to the Exercise in LSM to each participant individually. Additionally, the researcher demonstrated the segmentation of written Maltese words by marking each written word by its spaces.

Figure 9. 26: SW of LSM for (NAĦLA TTIR, ĦUTA TGĦUM) BEE FLY, FISH SWIM from the LMAP

 1.	 2.
Segmentation of SW text not per sign-box marked as 2 'words/signs'	*Segmentation of SW text per sign-box marked as 4 'words/signs'*

Perhaps the traditional definition of 'word/sign' is not known to the Deaf participants. However, the two most highly educated of the participants, who are trilingual did not mark the boundaries of the 'words/signs' at the end of each sign-box. These participants are also fluent in the spoken and written languages of Maltese and English and so it is highly unlikely that they are unaware of written word boundaries in written Maltese and English. Whatever the reason for the lack of marking signs/words in SW text, investigation into the recognition of the 'word' as a

psychological reality by native speakers/signers is of interest to the field of word segmentation (Section 3.11).

From the results of this work it can be concluded that 80% of the Deaf participants did not segment the individual sign-boxes of classifier clauses as individual signs/words.

9.10.2 Deaf Feedback: WE Classifiers and positioning

In Exercise 8 (Appendix C) the Deaf participants were asked to choose between the side and front positioning of classifier glyphs. The results of their preferences can be seen in Table 9.4 and Table 9.5.

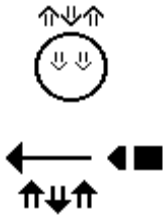
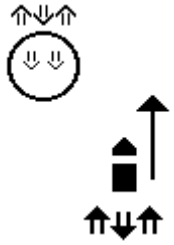
Table 9. 4: Preference for front or side positioning of glyphs in classifier verbs spelling VETTURA-TAQBEŻ-VETTURA (VEHICLE-OVERTAKE-VEHICLE)

	1	2	3	4	5	6	7	8	9	10
1. 	X	X	X	X	X	X	X	X	X	X
2. 										
Equally acceptable										

For the first LSM variant classifier verb spelling, all ten participants preferred spelling 1 in Table 9.6, i.e. the front positioning of glyphs. Participant 5 stated that spelling 2 couldn't be produced/articulated and Participant 2 claimed that this spelling was not

acceptable. Participant 6 said that spelling 2 would be acceptable if it was written diagonally like this:  rather than as it is in spelling 2.

Table 9. 5: Preference for side or front positioning of glyphs in classifier verbs spelling VETTURA-TOQMOS (VEHICLE-BOUNCE)

	1	2	3	4	5	6	7	8	9	10
1. 									X	
2. 	X				X			X		
Equally acceptable		X	X	X		X	X			X

While all participants preferred the front positioning of glyphs for the spellings in Table 9.4, in Table 9.5 six out of ten participants found the spellings equally acceptable. For spelling 1 of VETTURA-TOQMOS-L QUDDIEM (VEHICLE-BOUNCE FORWARD) there was only one preference for the sideway positioning of SW glyphs. Three participants preferred the front positioning of glyphs in the spelling 2.

Participant 3 remarked that spellings 1 and 2 are different. He commented that spelling 1 means VEHICLE-PASS SIDEWAYS-INFRONT-OF-ME whereas spelling 2

means VEHICLE-PASS FORWARD AWAY-FROM-ME. A similar comment was made by participant 7. Participant 4 also observed that there was a difference in meaning saying that spelling 2 contained the meaning of 'race'.

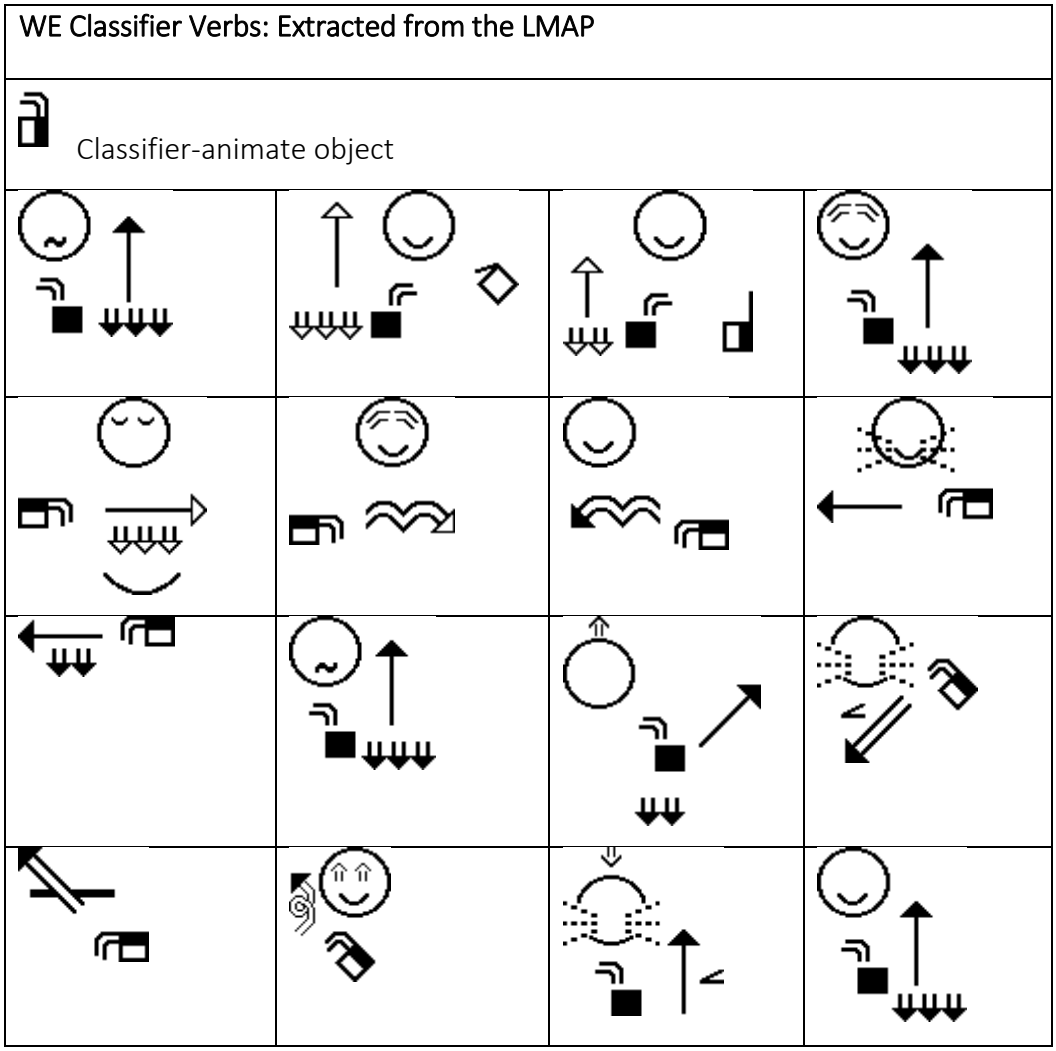
Many participants found both the spellings in Table 9.5 acceptable, yet not one found both the spellings in Table 9.4 acceptable. This might be explained by the use of the head glyph in the spellings of Figure 9.2.7. It is suggested here that the head glyph acts as a body anchor so when the handshape and arrow glyphs are written in relation to the body glyph, then its meaning changes slightly. Both spellings are acceptable because they both mean something different, as noted by participant 3. The positioning of the classifier handshapes in relation to the head glyph results in a different meaning, thus when the head glyph is included in the spelling of a classifier verb, the meaning of 'in relation to signer' may come about.

9.10.3 Movement of classifier handshapes in writing

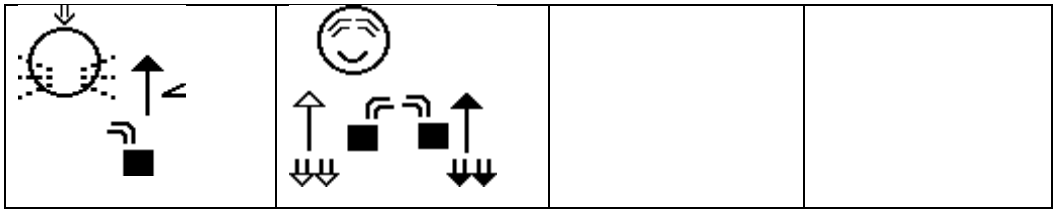
Some theories hold that there are innumerable movements required for the articulation of classifier verbs (cf. Liddell, 2003b), due to the predictable iconicity that reflects real life movements. Here it is argued that despite this theory, only a small amount of movement glyphs are required to represent predictable iconicity in LSM. These LSM movement-graphemes may then be combined with one another to express complex movements that might occur due to predictable iconicity. It is argued here that what is innumerable is the amount of combinations of movement rotations, movement sizes and relative positioning of handshape glyphs together

with movement glyphs and location glyphs. From the LMAP[57] variations of movement of the classifier handshape  have been listed in Figure 9.27. Here combinations of arrow sizes, rotations of glyphs together with the relative positioning of the handshape glyphs with one another can be seen in Figure 9.27.

Figure 9. 27: Some combinations of movement glyphs – innumerable possibilities for their sizes, rotations in their relative position in a sign with the other glyphs.



[57] Taken from *Nokklasafra (Goldilocks), Barnuża Ħamra (Red Riding Hood) and Passiġata (A Stroll).*



From all the different combinations of movement arrow glyphs seen in Figure 9.27, a small set of 'base' arrow-glyphs are listed in Figure 9.28. These base glyphs may then be modified for longer and shorter length, 360 degrees rotations and are reduplicated wherever necessary.

Figure 9. 28: A small list of 'base' arrow glyphs taken from Figure 9.27

Base Arrows taken from arrow-combination glyph variation in Figure 9.27				
				
Movement on a horizontal plane	Movement on a vertical plane	Bounce movement	Spiral movement	Arc movement

9.10.3.1 Proposal for a movement arrow-grapheme set for the representation of movements in LSM

From 1) the LMAP list of movements (see Appendix B,, Groups 13-20) and the proposal that a small set of base arrow-glyphs are required that may then be modified for size, rotation, reduplication and that they may combine with one another (Section 9.10.3), a proposed list of 17 LSM 'base-arrow glyphs' are suggested to represent movement in LSM (Figure 9.29).

Figure 9. 29: List of base movement arrow glyphs of LSM. Rules are then applied to each arrow to be modified according to need.

Movement Arrow Grapheme-Set for the writing of LSM		
HORIZONTAL PLANE	VERTICAL PLANE	AXIAL MOVEMENT
 FORWARD	 UP/DOWN	 ARM ROTATE
 ZIGZAG	 ZIG ZAG UP	 WRIST FLEX
 CURVE	 CURVE UP	
 WAVE	 WAVE UP	
	 UP-DOWN	
	 BOUNCE	
	 SPIRAL-UP	
	 UP AND OVER	
	 CIRCLE	
	 UP OVER CIRLE	
	 DOWN-UNDER	

Although the ISWA 2010 lists different sizes of arrow glyphs as different BaseSymbol glyphs (Appendix B), here it is proposed that a smaller set of arrow glyphs are 'bases'. It is proposed that one size for each LSM movement-arrow grapheme would suffice as a 'base'. Then each 'base' grapheme can be modified in a number of ways

to create grapheme-variants that may be needed to represent predictable iconicity in LSM. The arrow-glyphs in Figure 9.29 are proposed as the arrow grapheme-set for the writing of LSM movement (excluding contact glyphs). In addition to the SW principles of arrow-shading (Section 2.7.2) and rotations (Section 2.6), each one of these movement graphemes may then be modified resulting in grapheme-variants that represent 1) a larger and smaller movements, 2) a repeated movements and 3) combined-movements.

No arrow-glyph from Group 14 (Appendix F) are included in the LSM movement grapheme-list on the basis of the analysis carried out in Section 6.9 and Section 7.6.7.

9.11 CONCLUSION

This chapter has looked at the writing of LSM words, discussing issues on SW word boundaries, the positioning of SW glyphs in a sign-box, vertical and horizontal SW, prosody, punctuation and WE classifier verbs. Results of Deaf participants from the reading-questionnaire regarding these issues were included in the chapter. The LSM handshape grapheme-set is proposed in this chapter. A proposal for an LSM grapheme-set of movement is also derived from the analysis of this work and is presented in Section 9.10.3.

CHAPTER 10: SW OF LSM PRONOMINAL AFFIXING: AN ANALYSIS

10.1 INTRODUCTION

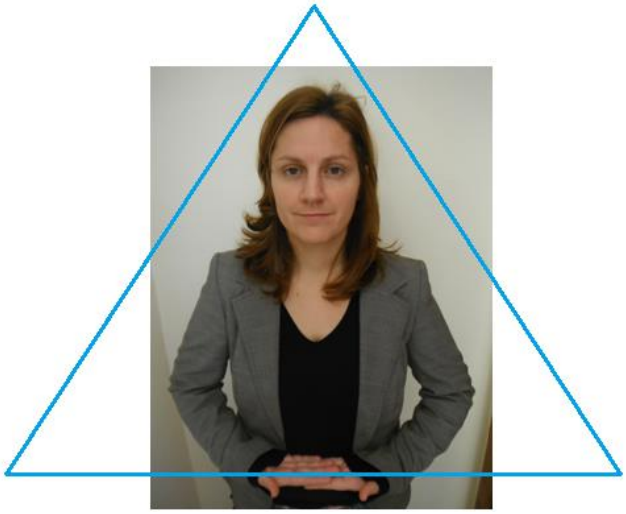
This chapter deals with issues related to the writing of pronominals in LSM and the related area of agreement verbs. The LSM signing space is described in Section 10.2. In Section 10.3 the ambiguity of pointing signs in the LSM texts is tackled. In Section 10.4 LSM person pronouns are analysed. On the basis of the difficulty of reading pronominal points in LSM a SW 'key' to disambiguate between these points and other pointing in LSM is proposed in Section 10.5.

In Section 10.6 the writing of LSM agreement verbs and the different forms of anchor-initial, anchor-final and free verbs are discussed and a proposal for the application of the SW 'key' for the writing of these verbs is carried out.

10.2 THE LSM SIGNING SPACE

The LSM signing space is the mental representation of the physical space where signing occurs. The signing space is usually represented by an imaginary triangle over the signer's body. This triangle has its tip starting just above the signer's head and has its base at waist level (Figure 10.1).

Figure 10. 1: The LSM signing space triangle



The traditional two main functions of the signing space is that it can be used grammatically or topographically (Klima &Bellugi, 1979). The literature regarding the use of the signing space is reviewed in Section 4.5.2 and Section 4.9.1.

10.2.1 Topographical Use of space

When the signing space is used topographically, handshapes move within the signing space, however the spatial points to which the hands move to are not symbolic or conventionalized, but rather mapped or graphed. If CL-VETTURA (CL-VEHICLE) moves to the left hand side, it does not move to a pronominal point, 3rd person. The area linearly in front of the signer is known as 'neutral space', i.e. the space directly in front of the signer that is not marked for any person or referent.

10.2.2 Grammatical use of Space

On the other hand, when the signing space is used grammatically, certain distinct location points are assigned different person reference. The location points are invisible, however, the hands move towards these points and when doing so they are 'inflected' (Section 4.9.1) for person. Section 4.9.1 describes how Meir (1998) describes only two distinctive pronominal point: 1st person and non-1st person and an argument against this was presented. Here Padden's (1990) framework is used to describe the LSM pronominal points.

10.3 POINTING SIGNS AND AMBIGUITY

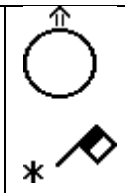
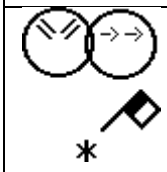
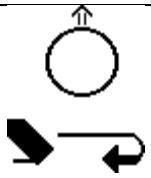
Sign linguists (cf. Meir et al., 2007; Cormier, 2012) are aware of the highly ambiguous nature of pointing signs in natural signing. The data presented in Table 10.1 is evidence that the ambiguous nature of pointing signs is transferred into the written system of a language, LSM (see also Section 6.5 and 6.6). This study provides evidence that using the ISWA 2010 for the writing of LSM results in a wide variety of similar SW forms that are ambiguous when reading.

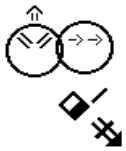
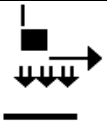
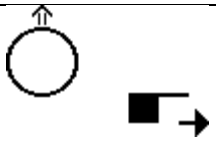
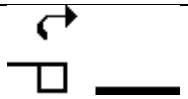
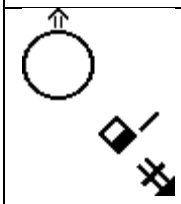
In the LSM texts one of the most immediately evident problems with reading concerned pointing signs (see Section 6.5). In Section 4.9.3 the literature concerning pointing signs was reviewed. Cormier (2012) describes three main types of pointing signs: pronominals, determiners and locatives. Locative pointing occurs in real-life signing, since it involves pointing to real-life objects. Since the analysis here concerns the written form, there can be no locative signs.

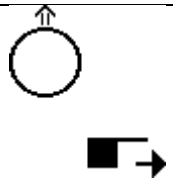
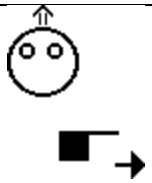
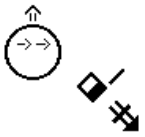
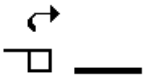
Thus the ambiguity of pointing signs in the LSM texts was mainly between pronouns and determiners. Besides LSM pronouns (Section 6.6), the following LSM signs involve index-finger pointing in the signing space: ILLUM (TODAY), HAWN (HERE), ISSA (NOW), HEMM (THERE), DAN/DIN (THIS), DAK/DIK (THAT).

In Table 10.1 a list of LSM SW pointing signs that were highly ambiguous are presented. All LSM SW signs are taken from the LMAP (Section 5.4).

Figure 10.2: Ambiguous SW LSM pointing signs. All examples are taken from the LMAP.

1st per			
			
			
			
2nd per			

			
			
3rd per			
			
			
ISSA (NOW)			
HAWN/ HEMM (HERE/ THERE)			

			
DAN/ DAK (THIS/ THAT)			
			
DAWM (THESE)			
(ISFEL) SOUTH			

10.3.1 Attempts to disambiguate between the similar SW forms

Attempts were made during the writing of the texts to disambiguate between the very similar forms of pronouns and determiners. Reason for attempting to change and modify the spellings was due to the observations of readers of the texts and their difficulty with these SW LSM signs.

One way of attempting to disambiguate between the SW form was by changing the handshape glyph's shading. It will be seen in Section 10.4, that for pronouns two

orientations are acceptable for the index hand. An attempt was made to keep one orientation for the writing of one group of pointing signs (e.g. determiners) and another shading of the glyph for another group of pointing signs (e.g. pronouns). However even though this was carried out, no regular spellings were established during the writing of the LSM texts (Sections 6.5 and 6.6).

Another way of attempting to disambiguate between the similar forms of pointing signs was by using different arrow glyphs for different groups of pointing signs. Once again no standard form was established during the writing of the texts.

One final means of attempting to disambiguate between the similar glyph-forms was by using the head glyph. This is discussed in Section 10.3.2.

10.3.2 Pointing signs and using SW head glyph as an anchor

In the SW LSM texts the head glyph is used when writing many pointing signs. This glyph seems to act as an anchor that helps bring out the spatial relationship between the hands and the body. In Table 10.1 above it can be seen that the head glyph has almost always been included in the SW of the LSM signs.

The only other known LSM SW text not found in the LMAP is found in the LSM dictionary (Azzopardi-Alexander, 2003). Here a written introduction to the LSM dictionary was written in SW by one of the Deaf participants in the study. The writer of the text was aware of the importance of the relation of the hands to the body and included a head glyph for every sign/word (see Figure 10.2). The head glyph was also used to carry facial expressions. In this text the writer used the smile very frequently. This is possibly a stylistic feature of letter-writing. Stylistic variations in SW would be

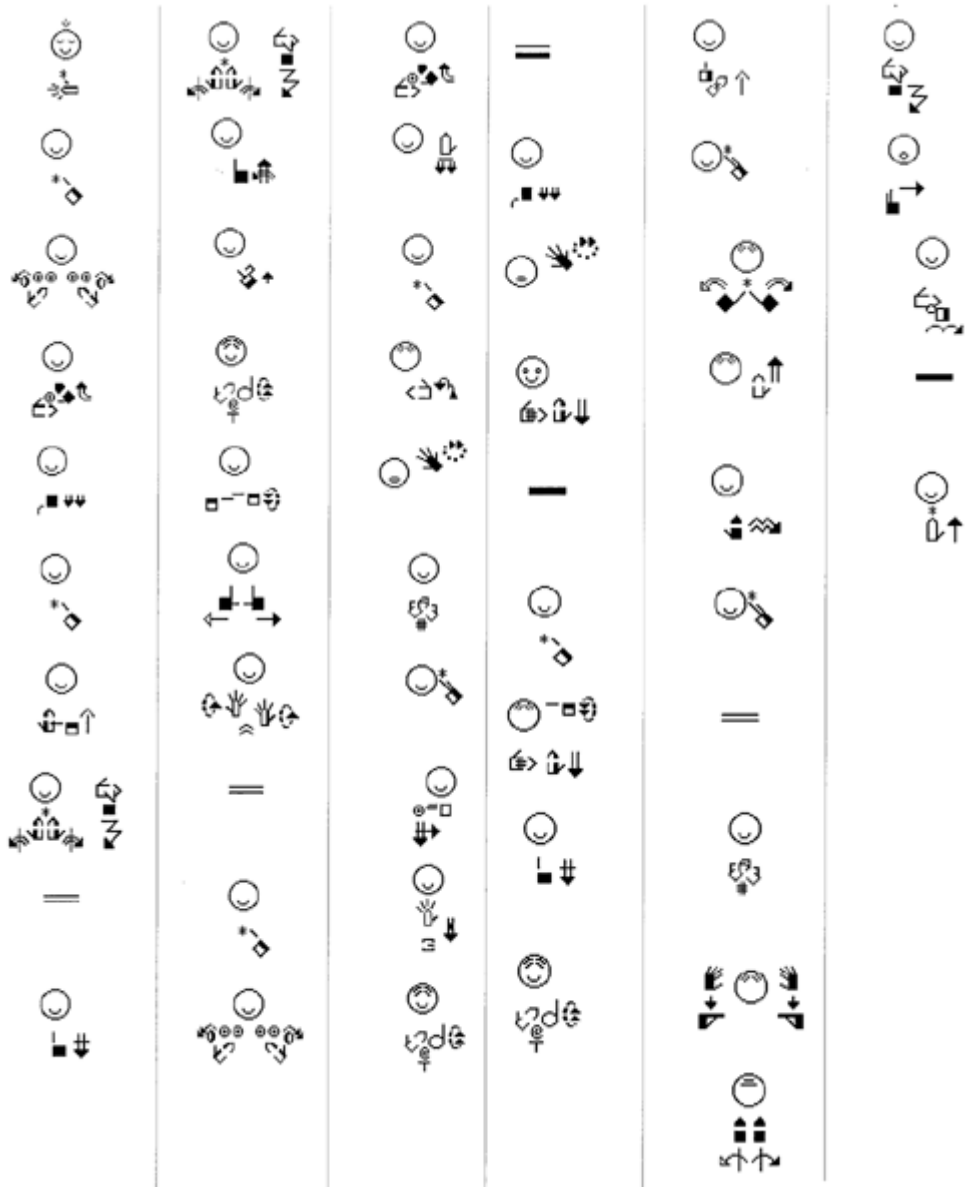
an interesting area of research for the future, but are not considered further in this work.

To further illustrate how pointing signs are not used systematically in the writing of LSM, the following pointing signs have been identified from the text in Figure 10.3:

1.  2.  3. 

As a reader of this LSM SW text (Figure 10.3), it took a while to disambiguate between the different types of pointing signs and realise that 1) refers to the SW of the LSM sign JIENA (ME), 2) ISSA (NOW) or ILLUM (TODAY), 3) L-EWWEL (FIRST). In fact there is no way of knowing whether SW sign 2) refers to ISSA (NOW) or ILLUM (TODAY). This is because both meanings are acceptable in context and the two LSM signs are homonymous. For such an example it might be useful to have a different spelling for each homonymous sign, in the same way that the English 'then' and 'than' are disambiguated in writing.

Figure 10. 3: The forward message in the LSM Dictionary (2003) written in SW, Volume 1 (Azzopardi-Alexander, 2003, p. iv-v) permission to use.[58]



[58] Translation: It is with great satisfaction that I am introducing this publication, the first part of the Maltese Sign Language Dictionary. I am very happy because for many years I dreamt about a dictionary that the Maltese Deaf could call its own. My dream has come true! In my opinion the dictionary will be a help in the education of deaf children. I think it will also help the development of Maltese Sign Language, especially in establishing a standard form of the language. This is possible because this is the first work that makes use of signwriting. Signwriting is a tool that allows one to write sign languages, in our case, LSM. I would like to express my sincere thanks to Dr Marie Alexander, Director of the Institute of Linguistics at the University of Malta, Mr. Alfred Bezzina, Director of the National Commission for Disabled Persons, and Ms Maria Azzopardi, linguist and LSM interpreter for all their work.

10.4 LSM PRONOUNS

In Section 4.9 the literature concerning pointing and pronouns was considered. An LSM pronoun is made up of a pointing hand, i.e. an index finger and a location in the signing space that is used grammatically (Section 10.2.2).

The handshape used for all person pronouns, except 1st person plural AꟾNA/ LILNA (WE/US) is the index hand and this is usually parallel to the floor. In SW the orientation of the palm is incorporated into the glyph (see Section 2.5). From the data of the LSM texts in the LMAP it can be seen that this orientation varies. There are instances of index-finger palm facing sideways, and other instances of index-finger palm facing down (see Figure 10.4). However there are never instances of palm facing upwards for pronouns. The handshape used for 1st person plural AꟾNA/ LILNA (WE/US) is a B-handshape.

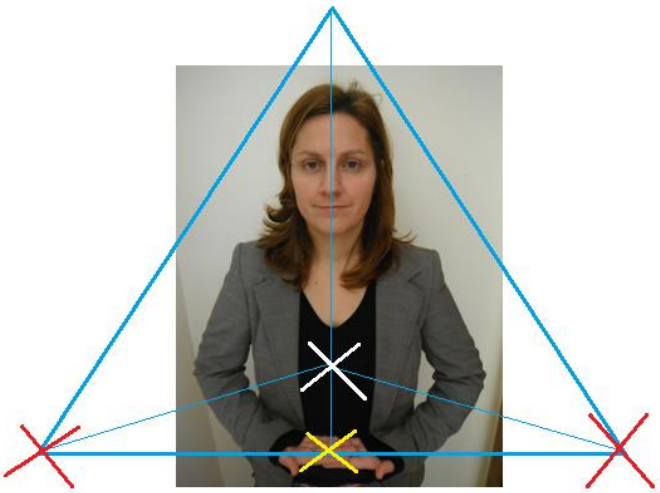
Figure 10.4: Index-Finger used in LSM pronouns with two variant orientations palm sideways and palm down) and one unacceptable orientation (palm up)

Pronoun index-handshapes: 

Pronoun index-handshapes: Palm orientation not-acceptable 

The second part of pronoun signs is the location parameter. Three person locations for LSM have been identified, based on Padden's (1990) framework (Section 10.2). The first location for first person in LSM is on or close to the signer's chest. The location for second person is right in front of the signer's chest. As for third person there are two distinct 3rd person locations to the right and to the left of the signer's chest (Figure 10.5). For argument on adopting a three-person distinction for LSM please refer to Section 4.9.1.

Figure 10.5: LSM Pronominal locations. Colour white: 1st person, yellow 2nd person, red 3rd person left and right.



The two third person pronouns can be referred to simultaneously without the ambiguity of pronominals in other languages such as English or Maltese. For instance in English the following utterance is highly ambiguous: *He gave him an apple and then he punched him.* Here it is clear that there are two 3rd persons however it is impossible to determine which 3rd person was punched. In LSM and other sign languages the referential points to the right and left would immediately

disambiguate which 3rd person pronoun receives the punch. In LSM the same utterance is signed as:

1a) TUFFIEĦA 3-PER XELLUG TA- 3-PER LEMIN, WARA 3-PER XELLUG DAQQA-PONN 3-PER LEMIN.

(1 a) APPLE 3-PER LEFT GIVE 3-PER RIGHT, AFTERWARDS 3-PER LEFT PUNCH 3-PER RIGHT.)

1b) TUFFIEĦA 3-PER XELLUG TA 3-PER LEMIN, WARA 3-PER LEMIN DAQQA-PONN 3-PER XELLUG.

(1 b) APPLE 3-PER LEFT GIVE 3-PER RIGHT, AFTERWARDS 3-PER RIGHT PUNCH 3-PER LEFT.)

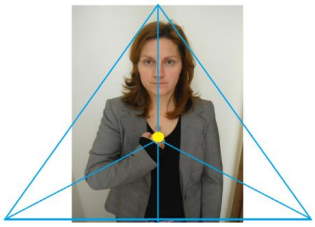
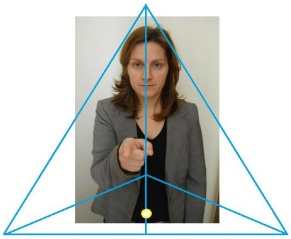
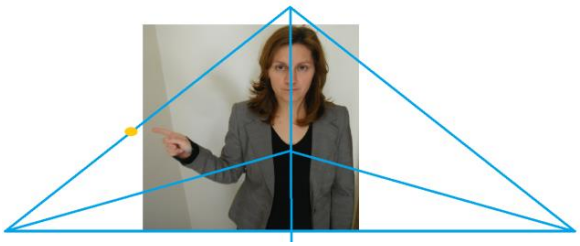
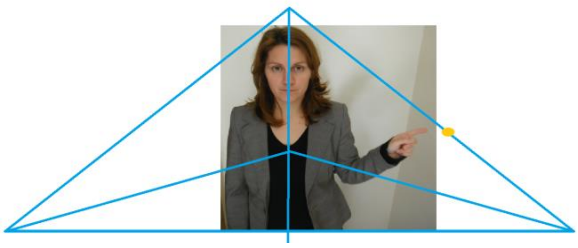
In examples 1a) and 1b) regular agreement LSM verbs involved TA (GIVE) and DAQQA PONN (PUNCH). These verbs have path movements that are directed to and from the two 3rd person points on the left and right. The start and end points of the path movements determine the giver (subject) and receiver (object) of the action. In this way the pronominal reference of the two different 3rd persons remains clear throughout the utterances. Agreement is discussed further in Section 10.6.

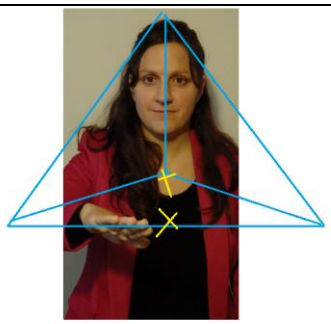
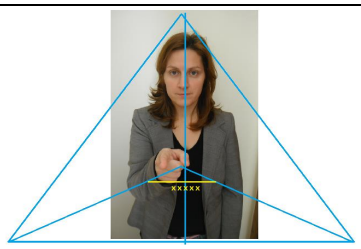
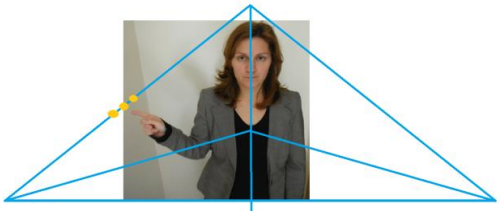
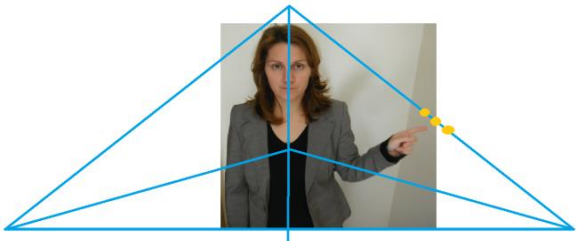
The actual LSM pronouns consisting of a handshape and pronominal point can be seen in Figure 10.6. LSM pronouns JIEN (I/ME), INT (YOU), HU/HI (SHE/HE/IT), INTOM (YOU) HUMA (THEY, THEM) are realised when the index hand, parallel to the floor, moves to either one of the singular points or sweeps over[59] a group of points

[59] See Section 10.7.3 concerning 'sweeping movement' vs. repeated-movement from Deaf feedback.

in the 1st, 2nd and 3rd locations. A group of points, rather than a single point represents plurality (see Table 10.2). The pronoun AĦNA (WE/US) is realised by the same sweeping movement over a group of points at the 1st person location, however this consists of a B-hand rather than an index-hand.

Figure 10. 6: LSM person pronouns with diagram showing pronominal locations in the signing space

GLOSS	SIGN
JIENA (I/ME) 1st person singular	
INTI (YOU) 2nd person singular	
HUWA/HIJA (HE/HIM/SHE/HER) 3rd person singular	 

AHNA (WE/US) 1st person plural	
INTOM (YOU) 2nd person plural	
HUMA (THEY/THEM) 3rd person plural	 

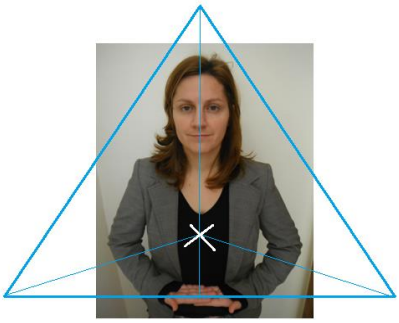
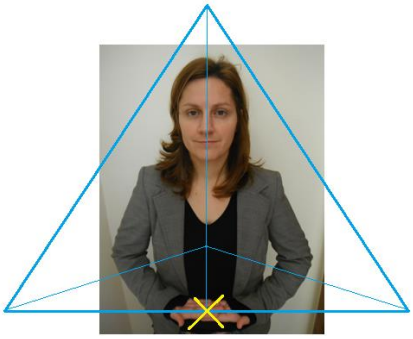
10.5 SW 'KEY' TO DISMABIGUATE LSM SW PRONOMINALS

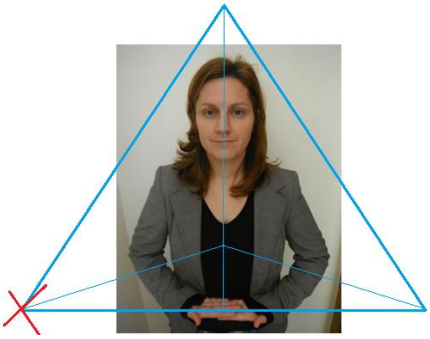
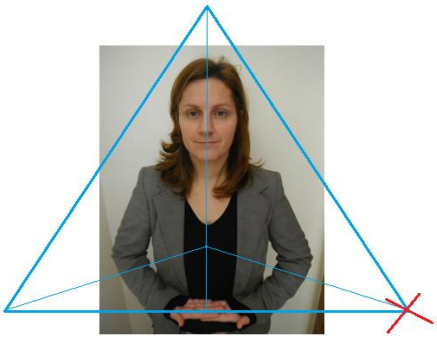
After understanding the difficulty with the reading of ambiguous SW LSM pointing signs a proposal to disambiguate the spellings is made. A 'key' to the writing of LSM pronominal points, and thus the writing of related pronouns and agreement verbs is proposed here (Figure 10.7). This would help disambiguate between pronouns and other pointing signs in LSM and help with the reading of the LSM texts.

10.5.1 The shoulder and tense glyphs to represent the signer's body and pronominal points

In this work it is proposed that the SW shoulder glyph ▬ is used to represent the signer's body. This glyph is then marked with 1-person, 2-person and 3-person points with the tense glyph ~ so that the relationship between the signer's chest location and the pronominal points becomes graphically clear. The tense glyph ~ is used in ASL writing to mark classifier handshapes that are positioned in space. From the analysis in Section 7.6.1 this glyph is also recommended to serve the same function for LSM.

Figure 10. 7: Pronominal points graphical key: the relationship between shoulder glyph and tense

	1-PER	
	2- PER	

▬▬ ~	3-PER rt	
~ ▬▬	3-PER lt	

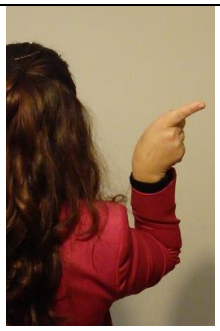
10.5.2 Why shoulder glyph was chosen and not the head glyph as anchor

The head glyph has been used to anchor the hands to the body and thus create a *relationship* between them (see Section 10.3.2). Deaf participants were not always able to read the intended pronoun despite the head glyph as anchor because both pronominals and other pointing signs employed the head glyph and thus there was no formal distinction was made between them. Additionally, the head glyph is often used to carry distinctive facial expressions in the sign, such as prosodic features (see Section 6.8), direct speech (Section 6.10) and even as a stylistic feature of certain written forms, such as the writing of a letter (see Section 10.3.2). The head glyph may thus be overloaded with markers if it is also assigned the role of an anchor to represent the relative position between the hands and the signer's body.

Additionally the SW rule is that the back of the head is represented by the head glyph, i.e. the SW head glyph is read expressively as though the reader is looking through this glyph (see Section 2.5). Positioning glyphs in relation to the head glyph may result in the misinterpretation of the handshape glyphs as being on top of the head or to the sides of the cheeks (see Figure 10.8).

One of the participants suggested using the top-view head glyph  . However this was not adopted in view of the other participants' responses. More of this can be found in Section 10.7.3.

Figure 10.8: Possible reading interpretation if the head glyph is used as an anchor for pronominal points.

Pronominal point spelling using head-glyph (instead of shoulder glyph)	*Possible reading interpretation*
	
	

The SW shoulder glyph seems to be read with greater ease (Figure 10.9). It was observed and confirmed by means of Exercises 7a) and 7b) of the reading-reading-questionnaire (see Appendix C) that the SW handshape glyphs written visually 'on top' of the shoulder glyph, are read as occurring in front of the signer's chest. The shoulder glyph together with the pronominal point glyph and the index-handshape glyph marking pronouns have been observed to help with the reading of the position of the hands at chest area (see Figure 10.8).

Figure 10.9: Reading interpretation of the pronouns spellings using the 'key' shoulder plus tense glyph.

How the shoulder glyph as anchor was read	
	
	

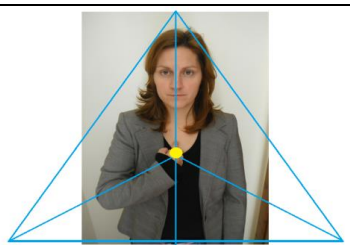
On the basis of these arguments it was decided that the SW shoulder glyph would be adopted for the representation of the body and pronominal points in LSM. The pronominal point glyph adopted to represent 2nd and 3rd person was the ~ glyph. Contact on the chest area usually occurs for 1st person in LSM and so the contact glyph * was adopted to represent the 1st person pronominal point. It was suggested

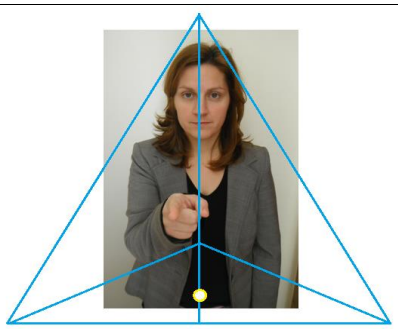
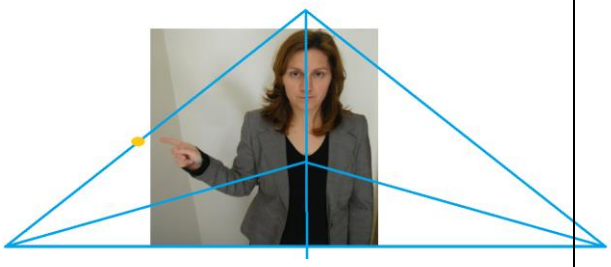
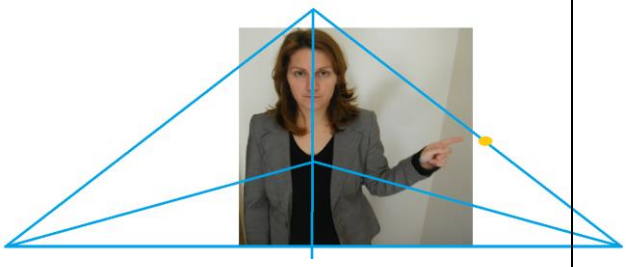
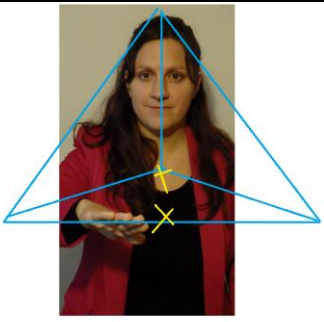
by a participant that the same tense glyph ~ is adopted to represent 1st person pronominal point in order to make the spellings of pronominal points more regular (see Section 10.7.3). Additionally sometimes contact does not occur for 1st person; rather the handshape moves close to or touches the signer's body, thus the tense glyph ~ is a more accurate representation of this. In the final recommendations to LSM writing the tense glyph ~ is recommended to be adopted as the glyph for all three pronominal points of LSM.

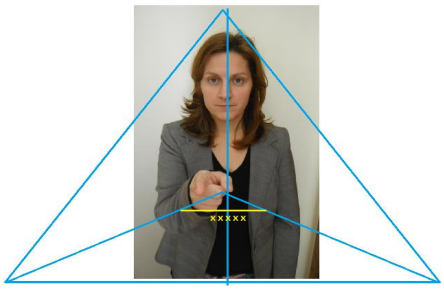
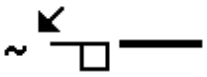
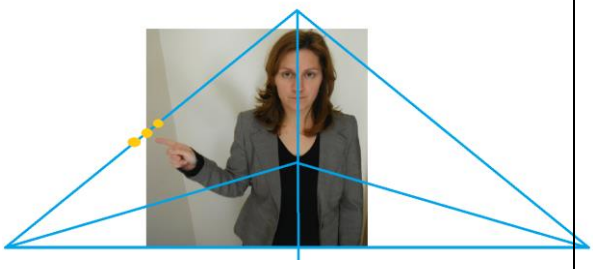
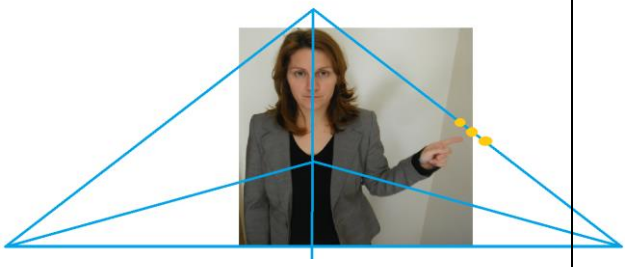
10.5.3 LSM pronouns written with SW 'key'

The representation of LSM pronouns using the shoulder glyph ▬▬ , the tense glyph ~ to mark the spatial locations and the handshape glyphs (index-hand and B-hand for LSM pronouns, e.g. ▀▜) can be seen in figure 10.10. The shoulder glyph ▬▬ together with the tense glyph ~ are the proposed key to the writing of LSM pronominal points.

Figure 10. 10: Proposed framework for the representation of LSM Pronouns using relative positioning of the shoulder and tense glyphs

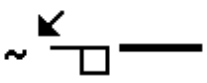
Pronoun	*SW Proposed Key*	*Image*
JIENA (I/ME) 1PER-SG		

INTI (YOU) 2PER-SG		
HUWA/HIJA (HE/HIM/SHE/ HER) 3PER-SG	 or  Or 	 
AĦNA (WE/US) 1PER-PLU		

INTOM (YOU) 2PER-PLU		
HUMA (THEY/THEM) 3rd person plural	 Or  or 	 

In Figure 10.10 it can be seen that 3rd person (singular and plural) right and left

locations can be produced with either the left or right hand



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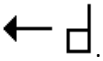
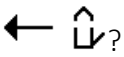
10.5.4 Deaf feedback: Preference for 'bounce' movement for plural

Eight Deaf readers commented that the written plural forms of the pronouns were not the ideal glyphs that represent the actual movement involved in marking plurality of LSM pronouns. They claimed that rather than a swiping movement (thus the ↙ straight movement glyph, a repeated downward movement was involved in marking plurality in pronouns. In the final recommendations, and the manual produced (Appendix G), the spellings for LSM pronouns are modified and plural pronouns consist of a repeated downward movement. It is interesting to note that this repeated downward movement, resembles the 'bounce' reduplicated movement identified in the LSM texts for plurality (Section 6.3).

10.6 LSM AGREEMENT VERBS IN SW

Agreement verbs are signs that are inflected by movement to and from the pronominal points. Discussion about whether this is inflection or a mixture of linguistic and gestural features is carried out in Section 4.9.1. In this work, this phenomenon is referred to as inflection of the sign. Agreement verbs differ from spatial verbs or WE (whole entity) classifier verbs where the movement of the hands are not directed to the pronominal points and thus do not inflect for person subject/object (Sections 4.9.1).

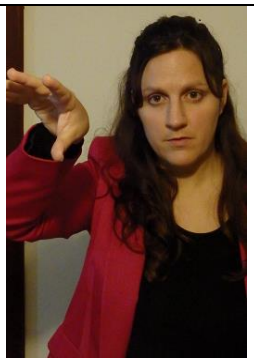
In the LSM data (see Sections 10.7, 10.8), it can be seen that the pronominal points were represented by the arrow movements towards the specific points. However these movements would encode right/left, forward/back, up/down locations in a way that made no distinction between the internal movements of other signs. For

instance in the LSM sign IT-TNEJN (MONDAY) the handshape moves from the right to the left. Also the classifier PERSUNA (PERSON) can move to the left, but does not require the reading of pronominal 3rd person left  . How can the movement arrow of the classifier read differently from the path movement of TA- 3 PERSUNA-XELLUG (GIVE 3RD-PERSON-LEFT)  ?

The SW arrows on their own, moving from the right to the left lane or vice-versa (see 6.7), seem to be insufficient to mark pronominal affixes. Once again the LSM SW pronominal key (Section 10.5) is adopted for the writing of anchor-initial and anchor-final agreement verbs.

A further distinction between anchor-initial, anchor-final (Johnston and Schembri, 2007) and free verbs was carried out (see Section 4.9.2). An LSM anchor initial verb is one such as AF (KNOW) and an anchor-final verb is FEHEM (UNDERSTAND) (see Figure 10.11).

Figure 10.11: An example of an anchor-initial and anchor-final LSM verb.

Anchor-Initial and Anchor-Final LSM verbs	
JAF (KNOW)	
FEHEM (UNDERSTAND)	 

There are also fully-anchored LSM signs, e.g. ĠERA (RUN) where the hands are bound completely to the body and are not free to move at any point during the production of the sign. These are also known as 'plain verbs' (Section 10.10 and Section 7.5).

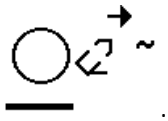
The general SW rule that suggests that the contact position is always written (see more in Section 2.9). Here it is argued that this recommendation causes a problem for poly-morphemic signs such as anchor-final and anchor-initial agreement verbs. In order to mark these different verb-forms in written form, the initial position of the hands needs to be written for these verbs (more in Section 10.8.4).

From the readings of the texts in the LMAP, the difficulty in reading the agreement verbs was similar to that observed for LSM SW pointing signs (Section 10.3). The reading of agreement verbs however seemed to be less problematic to read because the SW verbs would often contain eye-gaze markers (eye-arrow glyphs) that helped to mark the pronominal locations of 3rd person through eye-gaze to the left and right (see Sections 10.7 and 10.8 and Sections 7.7 for LSM data). It is proposed in this work that the LSM SW pronominal points key (Section 10.5) can be applied to LSM agreement verbs that are often inflected for pronoun points, through movement towards or away from the established 3-person pronominal points.

Sections 10.7-10.10 concern the writing of these different agreement verbs and presents feedback from the Deaf participants. In the reading-questionnaire (Appendix C) Exercises 7a and 7b were designed to receive feedback concerning the reading of pronominal affixing in LSM writing.

10.6.1 Vertical-plane agreement

From the data in the LMAP it can be seen that there are several examples, all related to the signs God, deity and the LSM sign 'giant', where the pattern of 3-person pronominal points for these referents occur at head-level rather than chest-level. This use of vertical space seems to be a lexical device (see Section 4.9.1 for more). In this work it is suggested that the same pronominal key of shoulder in relation to tense glyph could be employed, however the tense glyph would be placed at a larger distance away from the shoulder glyph. It is also suggested that the head glyph is included in these spellings, since they occur in this marked location. The LSM arrow

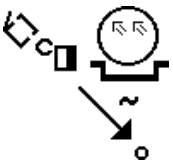
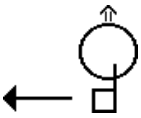
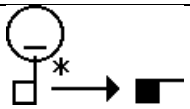
movements that are described in Sections 9.10.3.1 would then be directed to these tense glyphs. Thus the writing of an agreement verb TA (GIVE) to 3rd-person head level would be written like this:  .

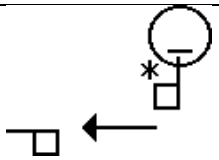
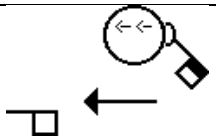
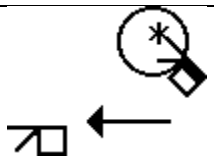
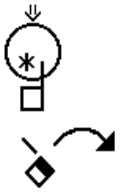
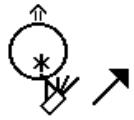
10.7 LSM ANCHOR-INITIAL AGREEMENT VERBS AND SW

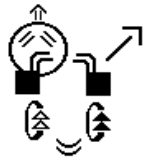
10.7.1 LSM anchor-initial agreement verbs in the LMAP

Figure 10.12 presents some LSM SW anchor-initial verbs found in the writings of the LMAP. More examples can be found in Section 7.7.

Figure 10. 12: A few examples of anchor-initial verbs found in the LMAP

	Anchor-Initial Verbs found in LMAP	*Data from*	*GLOSS*
1.		*Peter Pan 12*	RA-LEMIN-ISFEL (SEE-RIGHT-BELOW)
2.		*Peter Pan 09*	SPARA-FUQ-XELLUG (SHOOT- UP-LEFT)
3.		*Peter Pan 17*	QAL-XELLUG (SAY- LEFT)
4.		*Barnuza Hamra 27, 28. 29*	QAL–LEMIN (TELL-RIGHT)

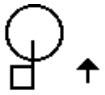
5.		*Barnuza Hamra 27*	QAL–XELLUG (TELL-LEFT)
6.		*Barnuza Hamra 27, 28. 29*	SEMA'-XELLUG (HEAR-LEFT)
7.		*Barnuza Hamra 28*	RA-XELLUG (SEE-LEFT)
8.		*Luqa 3:11*	QAL-LILKOM (TELL YOU PLURAL)
9.		*Luqa 3:12*	SAQSA LILU (LEMIN) ASK-HIM (RIGHT)
10.		*Luqa 3*:15	SAQSA LILI NNIFSI ASK MYSELF
11		*Luqa 3:6*	ĦARES FUQ LEMIN LOOK UP RIGHT
12		*Luqa 3:16*	QAL-LILHOM LEMIN ISFEL (TELL-THEM RIGHT DOWN)
13		*Luqa 21:25*	QAL–XELLUG (TELL-LEFT)

14		*Mattew2:2*	FITTEX (SEARCH FOR)

In Figure 10.12 it can be seen how due to the anchor-initial type of agreement verb the handshape has been placed at the initial location glyph. Furthermore in numbers 3-7 of Figure 10.12 the handshape glyph has been written also at its final location. This was done in an attempt to show in writing that the handshape has moved towards the third person on the left or right.

10.7.2 Anchor-Initial LSM agreement verbs using SW pronominal key

For anchor-initial agreement verbs the SW rule for writing by means of indicating the initial position of the hands in relation to the body was retained.

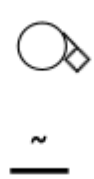
In the creation of these anchor-initial spelling the verbs are first written in their citation forms. Any internal movement arrow in the citation form was then dropped, e.g. In the LSM SW sign QAL (SAY) the forward movement is dropped from:  to  in order to add the path movements towards the pronominal points. The pronominal 'key' is then placed somewhere in the glyphs  . Since it is a shoulder glyph in this case the shoulder glyph is placed under the head and handshape glyphs like this:  ~ (QAL-3rd PERSON SINGULAR-RIGHT).

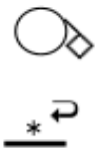
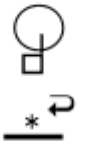
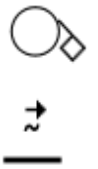
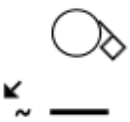
Finally, in order to write plural persons the arrow glyphs of movement that mark plural pronouns (Section 10.5.2) were adopted for the writing of pronominal affixes to express plurality in person of agreement verbs, thus the following was the result:

 (QAL-3RD PERSON PLURAL RIGHT)

Figure 10.13 shows four anchor-initial LSM agreement verbs using the SW key to represent the verbal inflections. Each agreement verb has the same SW pattern in the attempt to establish a graphical pattern of pronominal affixing in LSM agreement verbs. The spellings in Figure 10.13 were used in the reading-questionnaire to observe the Deaf participants reading.

Figure 10. 13: Proposed writing for anchor-initial agreement verbs with proposed key

RA (SEE)	*KIEN JAF (KNOW)*	*TKELLEM (SPEAK)*	*QAL (SAY)*	*+PRONOMINAL SUFFIX*
				-NI (ME)
				-K (YOU SG)
				-H/HA rt (HIM/HER rt)

				-(H/HA lt (HIM/HER lt
				-NA (US)
				-KOM (YOU PLU)
				-HOM rt (THEM rt)
				-HOM lt (THEM lt)

10.7.3 Deaf feedback: Preference for tense glyph over contact as 1st person point

Exercises 7a and 7b of the reading-questionnaire concerned the writing and reading of the LSM pronominal points. The ambiguity observed from the reading of pointing signs led to the proposal for the shoulder glyph and tense glyph ~ to be employed as a key to the reading of LSM pronominal points. This proposal was presented in Exercises 7a and 7b in order to receive feedback from the participants regarding the

writing of LSM pronominals. The results are not quantitative, but qualitative and provided the researcher with useful insights into the SW representation of pronominal points in LSM.

One participant suggested using the top-view glyph (see Section 10.5.2). Although it was an interesting suggestion, upon further analysis of agreement verbs, anchor-final and anchor-initial agreement verbs could not be represented using this glyph. Furthermore this suggestion was not adopted since all other participants had no trouble reading the pronominal points using the key established (Section 10.5).

One participant suggested that the 1st person glyph marked by a contact glyph is replaced with the tense glyph ~ in order to make all pronominal spellings regular. Thus the writing of LSM JIENA (ME/I) in SW would be changed from this spelling

 to this  .

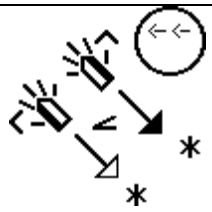
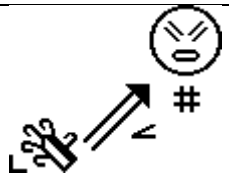
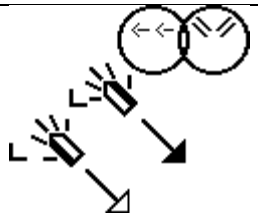
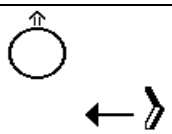
The similar comments received about the writing of anchor-initial verbs was that an arrow glyph is required to show the movement from the initial position to the pronominal point. Otherwise the pronominal point key (Section 10.5) was received warmly and the overall observation was that the pronominal points could be read through the SW spellings.

10.8 LSM ANCHOR-FINAL AGREEMENT VERBS AND SW

10.8.1 SW anchor-final verbs in the LMAP

In Figure 10.14 some LSM SW anchor-final verbs from the LMAP are shown.

Figure 10. 14: A few examples of LSM Anchor-Final Agreement Verbs in SW from the LMAP

	Anchor-Final Agreement Verb	*Data from*	*GLOSS*
1.		*Peter Pan*	QABAD-XELLUG (CATCH-LEFT LOC)
2.		*Barnuza Hamra 29*	KIEL-XELLUG (EAT-LEFT.)
3.		*Peter Pan 30*	QABAD-XELLUG (CATCH-LEFT)
4.		*Luqa 3:13*	TA-NI (GIVE-ME)
5,		*Luqa 3:12*	ĠIE (COME)

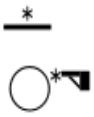
In Figure 10.14 it can be seen that the despite the anchor-final position of these verbs, the LSM verbs were not written with the handshape glyphs at the final anchored location. Rather the handshape glyphs are written in the first syllable of the word/sign (see Section 10.8.4).

In anchor-final verbs the signer's body is the lexical subject. This is discussed in more detail Section 4.9.5.

10.8.2 Anchor-Final LSM agreement verbs using SW pronominal key

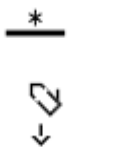
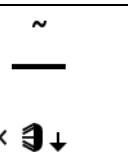
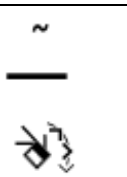
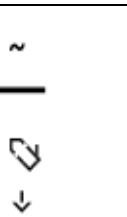
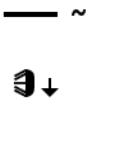
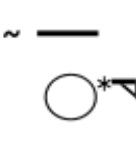
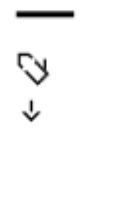
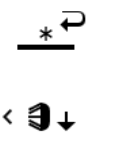
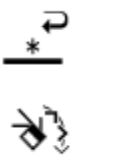
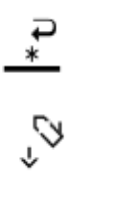
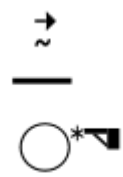
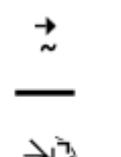
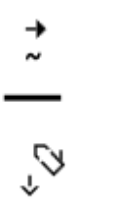
Unlike the proposed spellings for anchor-initial LSM agreement verbs (Section 10.7.2), for the SW of LSM anchor-final verbs spellings were created with the handshape glyphs at their final contact location. This follows the general SW rule (Section 2.9). It was thought that since this rule was followed, the Deaf readers would find the spellings acceptable. However Deaf feedback shows the contrary and these spellings were difficult to read (more in Section 10.8.3).

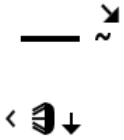
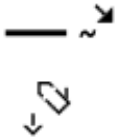
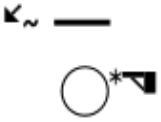
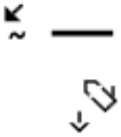
For these spellings the pronominal key (Section 10.5) was first written  , then the final-anchored verb was spelt with the handshape at the final location 

resulting in the following spelling of an anchor-final agreement verb: 

In Figure 10.15 anchor-final agreement verbs are represented in SW with the proposed SW key for each pronominal prefix. These were also presented to the Deaf to gauge their legibility and to gather any other feedback related to the reading of these written forms.

Figure 10.15: Proposed Writing for Anchor-Final Agreement Verbs with Proposed Key

FEHEM (UNDRSTAND)	*ḤATAF (GRASP)*	*SERAQ (STEAL)*	*LAQA' (WELCOME)*	*+PRONOMINAL PREFIX*
				NI (ME)-
				K (YOU SG)-
				H/HA rt (HIM/HER rt)-
				(H/HA lt (HIM/HER lt-
				NA (US)-
				KOM (YOU PLU)-

				HOM rt (THEM rt)-
				HOM lt (THEM lt)-

10.8.3 Deaf feedback: Preference for the Initial position of Handshape glyphs

The SW general guideline (Section 2.9) suggests that the contact position is always shown in the written form. However the Deaf readers expressed their preference for the re-positioning of glyphs at the initial position of the sign/word and not at the anchor-final position.

The Deaf participants could not read the anchor-final verb spellings well and the dominating comment was that the glyphs should be re-positioned, and that the handshape glyph should be placed close to the pronominal affix and that the arrow glyph should show movement away from the pronominal point.

10.8.4 Modifying the SW General Guidelines and Writing LSM Agreement verbs

In Section 2.9 the two basic SW guidelines were described. The first is the recommendation to always write the contact position of the handshape glyphs, and the second is to always write the centre of the sign. Writing the centre is achieved by

writing the contact position. When there is no contact involved it is recommended to write the initial position of the handshape glyphs.

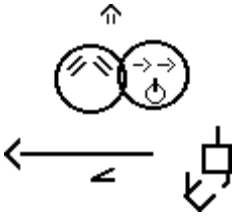
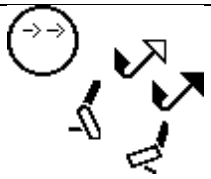
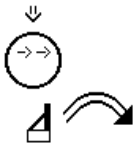
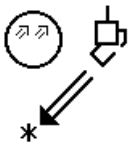
From feedback concerning the reading of anchor-final agreement verbs it was seen how the Deaf preferred the writing of the initial location rather than the contact position that is the final position of these polymorphemic verbs.

On the basis of this it is recommended that for the writing of LSM the general SW rule is modified. Rather than recommending the contact position to be always represented in writing, it is recommended to always write the *initial* position of the handshape glyphs. If the initial position is in contact with another location then it is recommended that the contact between the glyphs is shown by the relative position of the glyphs when this is possible.

10.9 LSM FREE AGREEMENT VERBS AND SW

In Table 10.9 some free agreement verbs of LSM have been found in the LMAP and are presented. Free verbs are much less common and fewer examples in the LMAP are available. A few examples have been found from the LMAP and are placed in Figure 10.16.

Figure 10.16: A few examples of free verbs from the LMAP

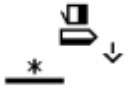
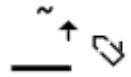
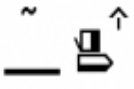
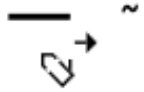
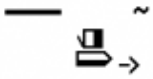
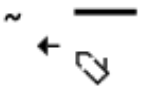
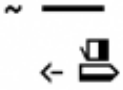
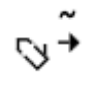
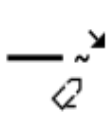
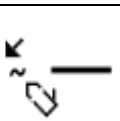
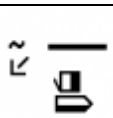
Free verbs found in the LMAP			
1. 	*Peter Pan 32*	GĦEN-LEMIN- MALAJR (HELP-LEFT-FAST)	*The 'L' in mouth is an observation from the Deaf who word 'help'.*
2. 	*Peter Pan 18*	ĠABAR-LEMIN DJAGONALI (LIFT UP-RIGHT DIAGONAL)	
3. 	*Luqa 3:13*	SERAQ (STEAL)	
4. 	*Luqa 3:11*	TA (GIVE)	
5. 	*L-Att Penitenzjali 02*	GĦEN-LILI	

The examples of free verbs used in the LMAP illustrate that just like the anchor-final and anchor-initial agreement verbs the handshapes have been written in their initial position of the sign/word.

Once again the key for writing pronominal affixing proposed in Section 10.5 is applied here in an attempt to obtain writing consistency of pronominal reference for free verbs in LSM. Figure 10.17 shows free agreement LSM verbs written into SW

using the key established in Section 10.5. More examples can be found in Section 7.7.2.

Figure 10.17: Free agreement verbs with SW proposed pronominal affixing key

TA (GIVE)	*GĦEN (HELP)*			*+PRONOMINAL SUFFIX*
				-NI (ME)
				-K (YOU SG)
				-H/HA rt (HIM/HER rt)
				-(H/HA lt (HIM/HER lt
				-NA (US)
				-KOM (YOU PLU)
				-HOM rt (THEM rt)
				-HOM lt (THEM lt)

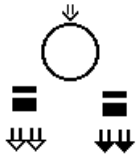
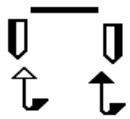
In Chapter 7 it was seen how the behaviour of free agreement verbs is similar to whole entity classifier verbs (WE verbs), where the hands are not bound to start or end in contact with the signer's body. The fundamental distinction between these types of verbs is that unlike WE verbs, free agreement verbs operate in the grammatical use of the signing space, i.e. they inflect to pronominal points.

10.10 LSM PLAIN VERBS IN SW

In Section 10.6 'plain verbs' were mentioned as uninflected signs and fully anchored signs. For the writing of these LSM signs it is proposed that the shoulder glyph and tense glyph key (Section 10.5) is not required, since these signs are not modified for pronominal reference. Some examples from the LMAP are provided in Figure 10.18. Plain verbs behave differently (see Section 7.5). They require a lexical noun or pronoun before the verb and do not contain path movements towards pronominal points in space.

Figure 10.18: Examples of LSM plain verbs and their writing using SW (all taken from the LMAP)

LSM Plain Verbs		*Gloss*
1. 	*Luqa3v10*	KKONVERTA (CONVERT)
2. 	*Luqa 3v3*	ĦAFER (FORGIVE)

3. 	*Luqa3v14*	GIDEB (LIE)
4. 	*Luqa 3v14*	GERGER (COMPLAIN)
5. 	*Luqa 3v15*	STENNA (WAIT)
6. 	*Luqa 3v4*	BENA (BUILD)
7. 	*Att Penitenzjali 06*	ĦASEB (THINK)
8. 	*Att Penitenzjali 06*	GĦAMEL (DO)
9. 	*Att Penitenzjali 06*	FARFAR (REJECT RESPONSIBILITY)
10. 	*Matt2v2*	TWIELED (BORN)
11. 	*Matt2v3*	TĦAWWAD (BE CONFUSED)

I

In Figure 10.18 it can be seen that although these SW signs are listed as 'plain verbs' it is difficult to tell whether they are verbal or adjectival. The other verbs move towards pronominal points and in their affixing behaviour it can be argued that they are a class of verbs. However the plain verbs in Figure 10.18 do not display this behaviour -they are not inflected for pronominal points. Neither are they spatial verbs (or WE classifier verbs) (Section 9.10), since they do not have the same patterns of movement as spatial verbs. Sometimes the word/sign order could determine the class of the word/sign (Azzopardi, 2001), but other times even this does not suffice as can be seen in number figure 10.18, no. 11) TH̶AWWAD (TO BE CONFUSED). Even if a nominal precedes it, this cannot confirm that it is a verb. This issue is not investigated further in this work. Further discussion can be found in Section 7.2.

10.11 DISCUSSION: SW ANCHOR-FINAL VERBS AND THE SW RULE OF WRITING CONTACT

SW is described as being both simultaneous and sequential: "Syllables are written sequentially in time. Syllable 1 always comes before Syllable 2. But inside each syllable, time stands still. The symbols inside one Syllable are happening at the same time. So SignSpellings are both simultaneous and sequential." (Sutton, 2008, p. 5[60]).

[60] No page numbers, however it is on the 5th page

SW is a writing system that can be simultaneously *read*. The overriding SW spelling recommendation is to *always write the handshape glyph at the location of contact* (Section 2.9).

It is argued here that for the writing of backward verbs or anchor-final verbs, the contact location is not always favoured by the Maltese Deaf readers, and when the anchor-final agreement verbs were spelt by showing the handshape glyphs at the position of contact (i.e. the final position) they were considered very complex by the participants. From feedback from Deaf participants in Exercises 7a) and 7b) (see Appendix C) it was seen that these spellings could not be read easily.

In the examples from the LSM data of anchor-initial agreement verbs (Section 10.6.1 and 10.6.2) the handshape glyph was always placed at its starting point. For anchor-final verbs following the general SW rule (Section 2.9), the contact position was written

Unlike anchor-initial and anchor-final agreement verbs, free agreement verbs are not bound to come into contact with the signer's body. For the writing of these verbs the beginning location of the hands needs to be marked in writing in order to establish the semantic roles of the verbs. For instance AGĦTI (GIVE), where the handshape glyph initial location is the right and moves to the left means that the right pronominal point is the agent and the left pronominal point is the receiver.

The rule that can be adopted for the writing of LSM agreement verbs on the basis of the work carried out here is as follows: for an anchor-initial LSM agreement verb the SW arrow glyph is directed towards the pronominal point glyph's ~ position on the

shoulder glyph ▬▬ . As for an anchor-final LSM agreement verbs the handshape glyphs are represented in their initial position and the arrow glyph represents movement towards the anchored position of the verb (Section 10.8.4).

10.12 FURTHER APPLICATION OF SW PRONOMINAL KEY

10.12.1 SW of LSM dual pronouns

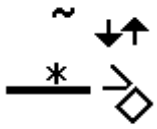
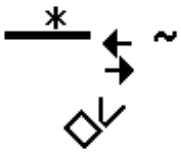
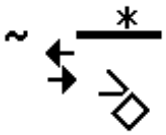
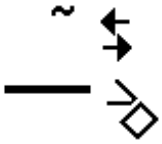
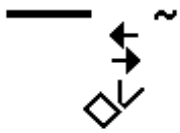
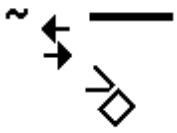
Using the proposed framework established for the writing of pronominal points and pronouns (see Section 10.5), LSM dual pronouns are recommended to be written using the same pronominal point key of shoulder glyph ▬▬ in relation to pronominal location glyph ~. Two examples of the written form of the dual pronoun are found in *The Christmas Story* (Galea, 2008) and are listed in Figure 10.19.

Figure 10.19: Two Dual Pronouns in the LSM Texts

Dual Pronoun	*Data from:*	*Gloss*
1. 	*Galea (2008, p. 2)*	3PER-DUAL HUMA IT-TNEJN (THEM-TWO)
2. 	*Galea (2008, p. 2)*	3-PER-DUAL HUMA IT-TNEJN (THEM-TWO)

Using the LSM pronominal glyph key for the writing of the pronominal system, by means of the anchored shoulder glyph ▬ in relation to tense glyph ~ (Section 10.5), the LSM dual pronouns may be written as follows in Figure 10.20.

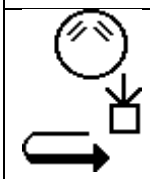
Figure 10.20: The writing of LSM dual pronouns using the glyph-key established in Section 10.5.

	AꟾNA IT TNEJN (JIEN +INT) US TWO (ME + YOU)
	AꟾNA IT TNEJN (JIEN + HU/HI LEMIN) US TWO (US=ME+HIM/HER/RIGHT)
	AꟾNA IT TNEJN XELLUG (JIEN + HU/HI/XELLUG) US TWO LEFT (ME+HIM/HER/LEFT)
	INTOM IT TNEJN (YOU TWO)
	HUMA T TNEJN LEMIN (THE TWO OF THEM RIGHT)
	HUMA T TNEJN XELLUG (THE TWO OF THEM-LEFT)

10.12.2 SW of LSM triple pronouns

A triple pronoun was also identified in the LMAP. The way this LSM sign was represented in SW can be seen in Figure 10.21.

Figure 10.21: An example of a Triple Pronoun in the LSM Texts

LSM Triple Pronoun	*Data from:*	*Gloss*
	*Nokklasafra 3*	1-PER-PLU/TRIPLE AĦNA T-TLIETA (US THREE)

Using the LSM pronominal glyph key for the writing of the pronominal system, by means of the anchored shoulder glyph ▬ in relation to tense glyph ~ (Section 10.5), 3rd person dual may be re-written as follows (Figure 10.22):

Figure 10.22: Rewriting of the dual Pronoun in the LSM Texts using the key established in Section 10.5.

	Proposed 3-PER DUAL using LSM pronominal key HUMA-IT-TNEJN (THEM-TWO)

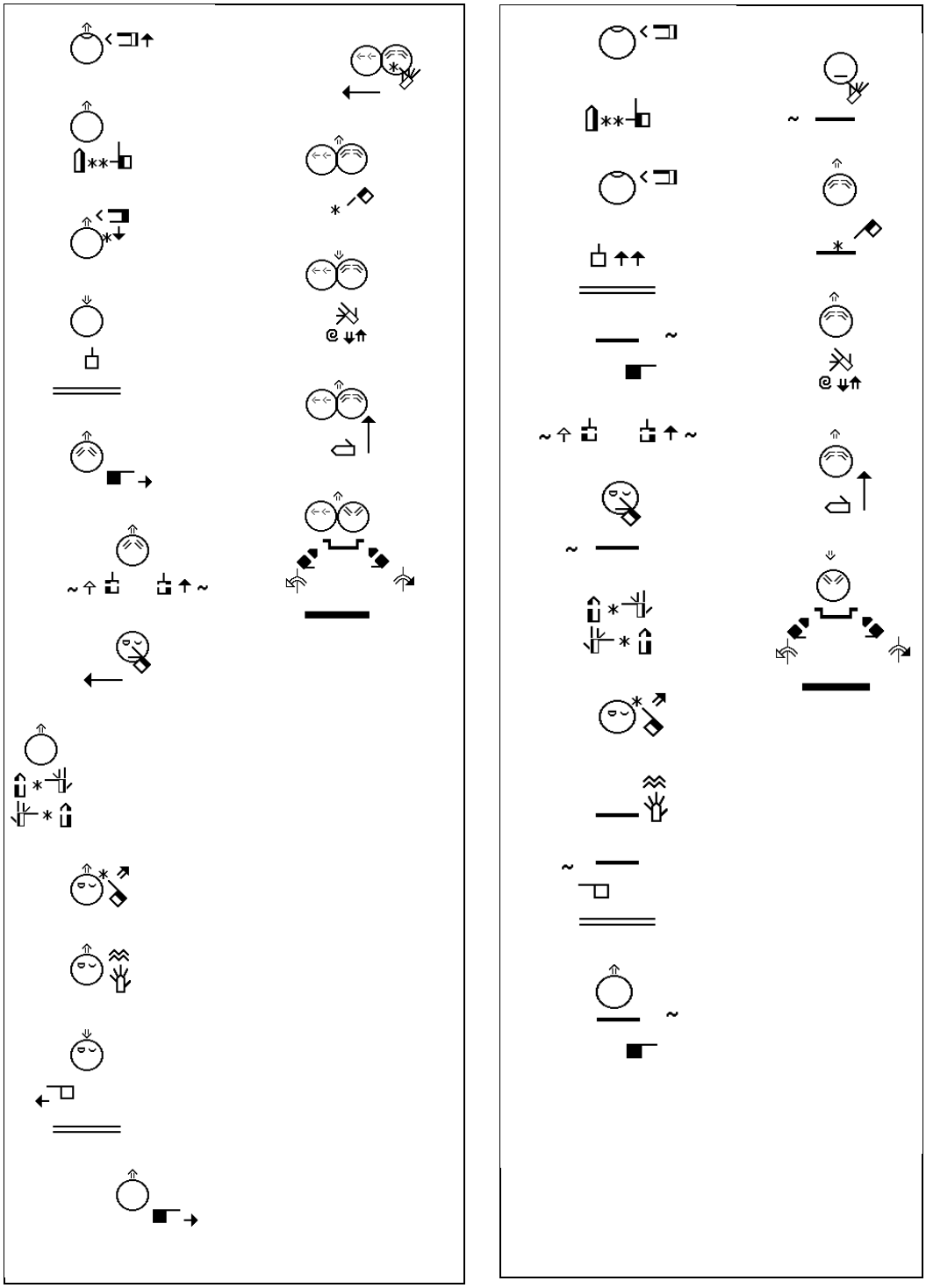
10.13 SW PRONOMINAL REFERENCE USING 3-LANE DISTINCTION?

SW signs can be written in vertical columns across three different lanes (see Chapter 9, Section 9.4). In Chapter 6, Section 6.7 the question was asked whether the

positioning of LSM signs in the centre, to the left and to the right in a vertical column brings about pronominal reference. It was concluded that although writing down lanes helped with the overall reading of the LSM texts, this alone was insufficient for the representation of LSM pronominal reference in SW.

An LSM sentence written prior to the 'key' can be seen in the left column of Figure 10.23. This sentence is then re-written using the LSM pronominal glyph key and can be seen in the right column of Figure 10.23 for comparative purposes.

Figure 10.23: (Luqa10v2) Left column is as found in the LMAP. Right column is the re-writing of this sentence.



10.14 CONCLUSION

In this chapter the writing of the LSM pronominal system was analysed. Problems with the ambiguity of LSM pointing signs were discussed. This led to a proposal for the solution to this ambiguity by using the shoulder and tense glyphs in relation to one another. This key was then applied to the writing of agreement verbs in an attempt to help make these verbs more clear and constant in their written form. The Deaf participants' feedback confirms that this proposed key does help with the identification of pronominal points in LSM spellings and thus helps to disambiguate between similar and unclear written forms.

CHAPTER 11: CONCLUSION

11.1 INTRODUCTION

This concluding chapter brings together the answers to the research questions through a synthesis of the findings for the reader's convenience. The findings of the analysis of the written form of a sign language such as LSM in relation to the linguistic analysis of the language in its primary signed modality contributes to the field of sign linguistics generally and to the study of LSM in particular. Some ideas for future research are outlined in conclusion to the chapter.

11.2 ANSWERING THE RESEARCH QUESTIONS

In this section the research questions that were derived from the Literature Review in Section 3.12.1 and Section 4.11.1 are answered.

11.2.1 How many glyphs are used for the writing of LSM?

A glyph represents a phone that can be a bundle of features or just one feature in LSM (Section 2.3.2; Section 3.6, Section 4.2.4). Therefore SW as a general system is best described as a featural writing system. 268 glyphs have been used for the writing of LSM out of the 652 glyphs of the ISWA 2010 (Section 8.5.1). The full list of glyphs can be found in Appendix F.

11.2.2 Are all the glyphs identified in the LSM texts required or can they be further reduced?

In this work an attempt was made to reduce the glyph-set used in the LMAP (Section 8.5 to Section 8.10.4). Feedback from Deaf readers who participated in this work indicates that variant handshape glyphs are rarely 'equally acceptable' (Section 8.6). The theories regarding predictable iconicity and the lexical-phonetic theory (Section 4.2.3) suggest that slight differences in handshape glyphs may be contrastive. On the basis of this it was suggested not to reduce handshape glyphs for the writing of LSM as they may be required for the representation of predictable iconicity. The glyphs that were preferred less were listed as alloglyphs that may be required for the writing of LSM and thus part of the orthography of LSM.

On the other hand feedback from Deaf readers concerning movement glyphs (Section 8.7) showed that the glyphs are often 'equally acceptable' providing evidence that the variant glyphs are truly alloglyphs and suggesting that for the writing of LSM fewer glyphs are required (than those found in Groups 13-20 of Appendix F).

On the basis of this evidence and from analysis of the LSM texts (Section 7.6), in this work a small LSM movement arrow-grapheme set was proposed (Section 8.10.4 and 9.10.3.1). Every grapheme can be modified in order to represent predictable iconicity (Section 9.10.3.1)

11.2.3 Is the smile glyph considered to be important for the LSM Deaf SW users?

The smile is considered to be important for the writing of greeting signs HELLO and GOODBYE (Section 8.8.2). However further investigation is required to understand the extent to which the smile glyph is acceptable in the writing of LSM.

11.2.4 How can the representation of space using SW, as found in the LSM SW texts, be modified to eliminate the ambiguity that arises in the SW of pointing signs and related issues of agreement in LSM?

A 'key' was created by the researcher from the linguistic analysis of pronominals in LSM and their representation in written form (Section 10.5). This key was checked with the Deaf readers and feedback concerning its readability was presented in Sections 10.5.4, Section 10.7.3 and Section 10.8.3. The key helped immensely in the identification of pronouns as pointing signs and furthermore helped the Deaf readers 'read' the pronominal affixing involved in agreement verbs.

11.2.5 Are the LSM texts unclear at times because of the redundant use of SW glyphs in LSM spellings?

The results of this work indicate that rather than the LSM text being unclear due to the redundant use of glyphs, ambiguity in the LSM texts was due to the lack of systematic ways of representing the spatial and abstract grammar of LSM and writing LSM phonetically rather than morphologically (see Chapter 10).

11.2.6 Since head-tilt patterns marking LSM prosody were included in some of the LSM texts, the question that arises here is whether these head-tilt markers are required for the reading of LSM.

A high percentage of Deaf readers in this study prefer the head-tilts to be removed from the texts (Section 9.7). This indicates that they are not required for the reading of LSM. Since the LSM texts have used only the stop and pause punctuation glyphs it is recommended that the question-mark glyph and exclamation glyph are included in the grapheme-set of LSM.

11.2.7 Do the Deaf LSM signers perceive a sign-box as the marker of an individual LSM sign?

80% of Deaf readers in this study do not recognise the sign-box as the marker of a sign (See Section 9.3).

11.2.8 Can the recommendations for the writing of LSM be listed and lead to the creation of a manual?

It has been possible to compile a list of final recommendations based on this study. A manual has been included in Appendix G for the immediate use in writing LSM. The manual can be refined on the basis of an extension of the study to observe writers and readers of LSM.

11.2.9 To have a workable glyph-set for the writing of LSM, does the orthography require the establishment of a grapheme-set that parallels the phoneme-inventory of LSM, or does a glyph-set that represents the phones involved in LSM suffice?

Although Coulmas (2003) states that the first step is to identify the graphemes for a given sign language, for LSM the writing recommendation does identify graphemes, but graphemes that can be modified regularly in order to be able to represent the predictable iconicity of LSM.

11.2.10 Can a grapheme-set be derived from the LSM texts or is there a challenge with the status of certain glyphs?

A grapheme-set of handshape and movement glyphs has been proposed for the writing of LSM (Section 8.10.4). An orthography suggests a closed set of graphemes and a closed-set of rules. Predictable iconicity may not always be represented since it is an open-class. In this work it is suggested that there are LSM handshape graphemes and LSM grapheme-variants. Furthermore it is suggested that the LSM movement graphemes may be modified with a few rules, to represent predictable iconicity, resulting in movement grapheme-variants when necessary.

11.2.11 How can an SW orthography of a sign language account for predictable iconicity of LSM, since predictable iconicity claims that there are innumerable movement possibilities?

Predictable iconicity is an open-class of visible contrasts that exists between phones in a sign language such as LSM. In the same way, sounds are an open-class of perceivable contrasts in the auditory medium. It is argued here that the glyphs of an

orthography are combined in innumerable ways to represent predictable iconicity. If an orthography had to contain enough glyphs to represent predictable iconicity it would mean that not even the ISWA 2010 glyph-set would suffice, but more glyphs would be needed.

In written forms of spoken languages there are ways to write sounds, e.g repeating the vowels to represent lengthening as in 'craaaaaash, booom cliiing, chlaaank!'. When writing a new sound, for example the sound of an alien character in a story, a writer simply uses the graphemes of the language to write that sound, e.g. 'ziiit ziiit shaboooz gadumbla!'. In the same way it is recommended that the graphemes of LSM are used to represent predictable iconicity whenever necessary.

11.2.12 Can a pattern of movement glyphs be derived for the writing of LSM Whole Entity (WE) classifier verbs?

Whole Entity (WE) classifier verbs are part of the predictable iconicity of LSM. Despite the innumerable possibilities for predictable iconicity a small set of movement graphemes are recommended for the writing of LSM (See Question 12).

11.2.13 How are LSM WE classifiers represented in written form, and is the topographical use of space marked in writing in any way?

The topographical use of space is marked by the positioning of whole entity classifiers in relation to one another (Section 9.10) and by the placement of one whole entity handshape in relation to the signer's body.

11.2.14 How are LSM handle (and locomotion) classifier verbs written using SW?

Handle classifier verbs are written with movement glyphs that represent the signer's movements that mimic real life movements (Section 7.5.3). The handle handshape glyphs represent the grip of the hands represented by the LSM signs. It has also been noted that the head-glyph helps with the reading of handle-classifier verbs, since the head glyph marks the signer's lexical body that is an integral part of the sign.

11.2.15 Are any markers included in the written form of LSM to distinguish between WE classifier verbs, Handle classifier verbs and Agreement verbs?

From this work it can be concluded that these three categories are marked differently. WE classifiers involve the use of classifiers whose position in relation to one another is meaningful (Section 9.10). Agreement verbs differ in written form since they require the use of the shoulder glyph and tense glyphs that mark pronominal points (Section 10.5). Handle classifier verbs (Section 7.5.3) involve the use of the head-glyph that is part of the lexical signs, since it marks the signer's body that is the lexical subject of these verbs. Also handle verbs do not involve marking of pronominal points, nor is the relationship between two handshapes significant.

11.2.16 How are LSM plain verbs represented in SW?

Handle classifier verbs have been treated as a sub-set of plain verbs in this work (Section 7.5.3). However from the written form it can be seen that plain verbs that are not handle verbs do not necessarily require the head-glyph to be read. They may also be read easily without the head glyph, e.g. GĦAMEL (DO), ĦADEM (WORK), KISER (BREAK) (Section 7.5).

11.2.17 How are regular and backward agreement verbs represented using SW? How can person locations that are involved in agreement verbs be represented using SW?

No regular way of writing the difference between regular and backward agreement verbs was found from the analysis of the data (see Section 7.7). From feedback from the Deaf readers in this study it is recommended to always write the initial position of the handshape glyphs rather than the contact position for anchor-final agreement verbs. Person locations may be established by using the shoulder glyph in relation to the tense glyph (Section 10.5).

11.2.18 Are LSM pointing signs ambiguous in written form, and does an attempt to disambiguate between the different pointing forms in writing contribute to the understanding of pointing signs in general?

LSM pointing signs are ambiguous in written form (Section 6.5 and 6.6). The attempt to disambiguate between the different forms in writing contributes to the understanding of pointing signs, because it provides evidence that LSM pronominal reference is marked in grammatical space. When the grammatical space is marked in writing, it disambiguates between pronouns and other pointing signs.

11.2.19 Is there any evidence in the LSM texts that reinforces Meir et al.'s (2007, p. 2) claim "that the subject argument is represented by the body and is part of the lexical structure of the verb"?

The writing of LSM handle classifier verbs reinforces Meir et al's (2007) claim that the body is part of the lexical structure of the verb. The writing of the head-glyph

marks the signer's body, and when the head-glyph is included in the spellings of handle classifier verbs, the signs are read as handle verbs easily (Section 7.5.3).

Additionally the body is not just a lexical subject but from evidence from the WE classifier verbs, the body glyph needs to be included if the classifier handshape moves in isolation, with no other classifier handshapes and the intended meaning is move-forward vs. move-sideways. Here the body is crucial in establishing these meanings because the classifier handshape moves forward and sideways *in relation* to the signer's body.

11.2.20 Can it be concluded whether the varying degree of openness of LSM handshapes, such as that noted by Azzopardi-Alexander (2003, p. 40) for FLYING INSECT is phonological or not?

As suggested by Channon (2002) and Crasborn et al. (2001) this type of iconicity is fuzzy-edged. It might best be described as a phonetic-lexical difference. In this work Deaf readers would not mark the differences in openness as equally acceptable and this means that the difference may be significant to them (Section 8.6). On the basis of this it cannot be concluded that they are just phonetic differences. This fuzzy-edged area of sign language iconic phones is a challenge to structural linguistics. Channon (2002) suggested maybe another layer is required to describe grammar, that of iconicity.

11.2.21 Are facial expressions involved in direct discourse and do they need to be marked in writing?

Not enough data has been gathered concerning facial expression glyphs. They have been found to be involved in direct discourse (6.10), but whether or not they require to be marked across the whole stretch of direct discourse requires another future study. A list of the most common facial expressions found in the LMAP has been identified in Section 7.9.

11.3 SYNTHESIS OF THE WORK AND FUTURE RESEARCH

The main contributions of this work are: 1) a description of the LSM pronominal system and LSM agreement verbs, 2) a description of LSM whole entity classifier verbs, 3) a description of LSM handle classifier verbs, 4) proposed LSM grapheme-sets for LSM handshapes and movements (Chapter 8) that indicate the corresponding LSM handshape and movement phonemes, 5) principles of orthography for the writing of LSM (Appendix G).

11.3.1 Reading LSM Pronouns/Agreement Verbs: Evidence for Agreement

It can be concluded from this work that the LSM pronominal system consists of a 3-person distinction as proposed by Padden (1990) (see Section 4.9.1).

The work of disambiguating LSM written pronouns from all other written LSM pointing signs (Chapter 10) indicates that the LSM signing space is used grammatically for pronominal affixing. Unless the abstract grammatical space is

marked in writing (see Section 10.5), the target LSM pronouns cannot be accessed by the reader.

It is also claimed here that LSM agreement verbs do involve grammatical marking of pronominal affixes (regular and abstract pronominal points in space). LSM agreement verbs are read with ease only when they are marked in SW for pronominal points, or in other words when the spellings of these verbs include the morphemes that mark pronominals.

11.3.2 LSM Whole Entity (WE) classifier Verbs

Another conclusion from this work concerns Whole Entity (WE) classifier verbs. LSM WE classifier verbs are marked in written form by the absence of pronominal-affixes. Furthermore the use of topographical space is marked in two ways. For a one handed classifier verb, the signer's body needs to be included in the spelling (by means of the head glyph) in order to establish a bearing of the WE classifier handshape *in relation* to the signer's body. Here the different relative positions of the handshape glyph and the signer's body-glyph result in different meanings (such as CL-VEHICLE MOVE SIDEWAYS vs MOVE FORWARD).

For two-handed LSM WE classifier verbs the relative positioning of the signer's body-glyph to the handshape-glyph no longer requires marking. Rather, the relative positioning of the handshape classifier glyphs with one another needs to be marked. Thus in the LSM written form of two-handed WE classifier verbs, the body-glyph need *not* be included in the spellings in order to be read. Rather, the different

relative positioning of the handshape classifier glyphs with one another results in different meanings.

The analysis of the written form of LSM Whole Entity classifier verbs confirms the theory that WE classifier handshapes employ the signing space topographically, i.e. topographical space is used to establish the relationship between objects (Emmorey et al., 2002, p. 812).

Although it has been established that the signer's body (use of head-glyph) helps with the reading of LSM one-handed WE classifier verbs, further research is required to understand which facial glyphs, if any, are required for the writing of these verbs.

11.3.3 Handle Classifier Verbs

LSM handle classifier verbs have been categorised in this work as part of the group of plain verbs. However, handle classifier verbs are distinct from other plain verbs since the work here indicates that LSM handle classifier verbs are read more easily when the head-glyph (including facial expression glyphs when necessary) is included in the spellings.

Three main types of LSM handle classifier handshapes have been identified from the analysis (Section 7.5.3) of this work: the A-hand (that represents a closed grip), a B-hand that represents a wider grip than the A-hand, and a baby-O (varies Inter-T and F) hand that represents the pincer grip that involves index finger and thumb. All these verbs involve movement patterns that mimic real-life movement. The reading of these LSM handle verbs appears to be facilitated when a head-glyph with facial expressions is included (Section 7.5.3.2).

Both one-handed LSM WE classifier verbs (Section 11.3.2) and LSM Handle classifier verbs read more easily when the head glyph is included in the spellings. There is a slight indication in the data (Section and Section) that one-handed WE classifier verbs are read easily when the head glyph (without further glyphs)  is included, or when the head-glyph with the LSM adverbial intensifier (air-blow out of mouth)  glyph is included in the spelling. LSM handle classifier verbs seem to read more easily when the head glyph is used in spellings with a range of different facial expressions. The use of facial expressions in LSM and their involvement in different LSM verbs however requires further investigation.

11.3.4 The LSM Orthography

From this work an LSM grapheme-set for LSM handshape phonemes and LSM movement phonemes has been established (see Appendix G for full established grapheme-sets). LSM SW graphemes reflect the phonemes for handshapes and movements of LSM. Thus each grapheme may be considered a phoneme of LSM.

An analysis of the other parameters of head/face, dynamics, contact and body glyphs for LSM has not been pursued in the same amount of depth. However, in Appendix G grapheme-sets for these other parameters have been derived from the LMAP (Appendix F) in order to establish a working grapheme-set for the writing of LSM.

With more writers and texts available, future research may re-analyse the orthography LSM, where the LSM grapheme-set may be further reduced or increased. Whatever the case, the work carried out here provides an immediate

working orthography for the writing of LSM and a base for future research into the orthography of LSM (Appendix G).

Apart from the LSM grapheme-sets, from this work different spellings for LSM pronouns, agreement verbs, whole entity verbs, handle classifier verbs and plain verbs have been recommended in order to disambiguate between previously identified similar and at times ambiguous SW forms. The work carried out here intends to enable the LSM writer to represent these linguistic aspects of LSM in readable written form.

11.4 GENERAL CONCLUSION

SW, or the International SignWriting Alphabet (ISWA, 2010) is a writing system that contains enough glyphs to represent any sign language in written form. As a general system it is best described as a featural system (see Section 3.6). When the SW glyphs are used graphemically and when SW evolves into an orthography for a specific SL such as LSM, it is best described as an alphabet.

This work investigated the development of SW from a general writing system to a language-specific orthography for LSM (Chapter 8). The conclusion that different glyph-sets are used by different sign languages suggests the evolution of a single writing system SW into different orthographies.

In Chapter 8 and 9 it was suggested that the alphabetic nature of SW should be salvaged while incorporating predictable iconicity by allowing grapheme-modifications that would result in LSM 'grapheme-variants'.

In Chapter 10 it was suggested that the shoulder glyph should be used to clarify pronominal reference, thereby obviating the need for a three-lane vertical system. In Chapter 9 it was observed, on the basis of the questionnaire data, that word boundary detection in SW may not be as straightforward as in other writing systems. This may in turn offer a challenge to traditional models of reading and lexical retrieval.

The work carried out in this dissertation was also novel in using the written form of Maltese Sign Language (LSM) in order to provide theoretical contributions concerning the grammar of LSM, particularly the pronominal system (together with agreement verbs) and classifier verbs in LSM.

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APPENDIX A: INCREASING LITERARY WORKS AND PROJECTS IN SW

A1 INTRODUCTION

This appendix is dedicated to the listing of as many literary works and other projects in SW as possible in order to clarify any doubts about the accelerating expansion of SW across the world.

Konrad and Langer (2009) state that here is no literary tradition in the writing of sign languages and that written texts cannot be used as a corpus. Johnston and Crasborn (2006) mention SW as a "putative" writing system. They claim that there are no written forms of signed languages, no folk linguistics associated with writing, no standardization associated with the spread, no teaching of writing, no written literature (i.e., no reference or sacred texts), no culture of writing (i.e., no elite enforcing standards), no possibility of 'text mining'. Furthermore unlike spoken languages, they claim that there is not even a widely used transcription system like IPA.

> The sign language experts who had already written hundreds of sign language documents in the SignWriting script by 2009, in multiple sign languages, if asked, would probably not have agreed with the above claims. In Nicaraguan Sign Language alone, there were already 40 books written in SignWriting, some of great length, used daily in two schools in Nicaragua, long before 2009. And in Germany, for example, at the Osnabrück School for the Deaf, the Deaf students were reading

> from documents that translated German textbooks into written German signs, before 2009. Stefan Woehrmann's list of documents from Germany has been building steadily for over a decade. (Sutton personal communication February 2014).

SW literature is accumulating across the globe with main advances in children's stories and biblical translations. The inventor Valerie Sutton is no longer able to keep track of all the works that are being produced in SW (Sutton, personal communication, March 2012),

> This is partly because of the large volume of new written works, and partly because writers take it for granted that sign languages are written languages and see no reason to inform me of their daily writing and publishing. They have never met me and do not realize I am open to documenting their work. When they find that I am interested in documenting their work, they eagerly share and the amount of works is mind blowing. An example is the country of Tunisia. There are so many SignWriting documents to post for Tunisia I am always 6 months behind ...and Slovenia...I can only say it is amazing how many writers are writing their sign languages in small groups all over the world. (Sutton, personal communication, February 2014)

SW has been referred to as a 'writing system' ever since its creation. However, it is becoming a writing system through the increasing use and writing of literary texts

and dictionaries that are used and read by sign language communities around the world.

The lists of works provided in this chapter are not exhaustive, as it is impossible to acquire and list all unpublished works. Many works may be still unknown. What is listed here is what the researcher has been able to trace.

A2 SW LITERATURE

> Literary works that use SignWriting are available in PDF, eBook readers, html pages, printed bound books, PowerPoint and Keynote slides that capture complete books from beginning to end, and books can be read online, page by page, in SignPuddle Online. SignWriting literature is now read on iPhones and iPads and in test Wikipedias online (Sutton, personal communication, February 2014).

Literature started to be written soon after the invention of the system back in the 1970s, and has accumulated gradually over the years. However a sudden acceleration in the accumulation of literature has been observed over the past four years (2009-2013). There is now a very large amount of corpus of written ASL.

The largest amount of work inputted into Literature Sign Puddles is work on the ASL Bible. The majority of the New Testament is now written in ASL:

1) ASL Bible Dictionary

http://www.signbank.org/signpuddle2.0/index.php?ui=1&sgn=28

2) ASL Bible Translated from the New Living Translation (NLT) (by Interpreter Nancy Romero) http://www.signbank.org/signpuddle2.0/index.php?ui=1&sgn=151

3) ASL Bible Transcribed from Deaf Missions ASL Videos (by the Shores Deaf Church) http://www.signbank.org/signpuddle2.0/index.php?ui=1&sgn=152

The University of Malta has carried out projects through the Maltese Sign Language Project of the Institute of Linguistics and a considerable amount of written texts are now available for LSM. These texts include children's stories, bible excerpts and traditional prayer and mass rites all translated from Maltese directly into written LSM using SW. The full account of texts can be found in the LMAP.

Brazil Bible documents in Brazilian Sign Language (LIBRAS) have been translated from Portuguese to LIBRAS and written in SW by Sergio Ribeiro. Documents created with SignWriter DOS are found at http://www.signwriting.org/archive/docs5/sw0459-BRBible-Textos-Biblicos-LIBRAS.pdf

A directory of biblical works written in SW (not all, but those that are known) can be found here: http://www.signwriting.org/library/bible . There are works in Norwegian Sign Language, ASL, LSM, Tunisian Sign Language and LIBRAS (see Appendix 3 for Tables of Biblical works).

A3 SW MANUALS

Valerie Sutton has written more than eight textbooks teaching SW since the beginning of the system in 1974, including: "*Sutton Movement Shorthand, The Sign Language Key*" (1978); "*SignWriting For Everyday Use*" (1981); "*SignWriting For*

Research Use" (1982a); "*SignWriting Shorthand For Sign Language Stenography*" (1982b); "*Lessons in SignWriting Textbook, First Edition*" (1990); "*Lessons in SignWriting Textbook, Second Edition*" (1995); "*Lessons in SignWriting Textbook, Third Edition*" (2002). Sutton also created and published SW instruction on html web pages: (http://www.signwriting.org/lessons/web/), including "*SignWriting E-Lessons, Questions & Answers on the SignWriting List*" and "*SignWriting HandWriting Courses*", and "*Learn to Read ASL*".

In 2001, linguists Stephen & Dianne Parkhurst from Spain wrote an instruction textbook called "*SignoEscritura, Un sistema completo para escribir y leer las Lenguas de Signos*". That same year it was translated into English & Spanish Sign Language (LSE), called "*SignWriting, A Complete System For Writing and Reading Signed Languages*". In 2008, the Parkhursts published a third SW manual "*A Cross Linguistic Guide to SignWriting*".

In 2005 in Germany, Stefan Wöhrmann, a teacher of Deaf children at the Osnabrück School for the Deaf, who has used SignWriting with his Deaf students since 1999, produced the textbook "*FRID*", a hardback instruction book published by Birgit Jacobsen. An English translation comes with the book.

In 2009, Sutton started the "*SignWriting Reference Manual*" series, entitled "*SignWriting: Sign Languages are Written Languages!".* There will be at least five manuals when the series is complete. The first manual, entitled "*Manual 1: SignWriting Basics*", also called the *SignWriting Basics Instruction Manual*, was published in 2009. The second manual, "*Manual 2: SignWriting Hand Symbols in the*

International SignWriting Alphabet 2010" has photographs accompanying each hand symbol. This second manual was produced by Valerie Sutton and Adam Frost, 2010 – 2014. A full page is dedicated to each of the 261 hand symbols of the International SW Alphabet (ISWA 2010). These handshapes are used to write over 40 sign languages. Each page of this manual shows one handshape with six photos that illustrate six different palm facings. The corresponding SW symbol is presented right next to each photo. An animated version of the SW Hand Symbols book is presented on the web by Adam Frost: http://www.signwriting.org/lessons/iswa/ .

The most recent SW publication is the "*American Sign Language Hand Symbols Manual*", by Adam Frost and Valerie Sutton (2013). The entire manual is dedicated to ASL handshapes. The lead author, Adam Frost, is a Deaf linguist and ASL signer, who has searched for all the handshapes used in the three ASL Puddles online (ASL Bible, ASL Literature and ASL Dictionary Puddles) and listed these handshapes as specifically the handshapes of ASL. This work moves away from simply describing the handshapes of SW that can be used to write any sign language, and rather it focuses on the handshapes of a specific sign language.

Sutton's manuals have been translated and expanded into French and Swiss-French Sign Language by Anne-Claude Prélaz-Girod's (2002), into Spanish and Spanish Sign Language by Irma Maria Muñoz Baell with Stephen and Dianne Parkhurst entitled "*Primeras Lecciones de SignoEscritura*" (this is a separate work from the Parkhurt's other textbooks on SW), into Portugese and Brazilian Sign Language (LIBRAS) by Dr. Marianne Rossi Stumpf, into Norwegian and Norwegian Sign Language by Dr. Ingvild

Roald (2007), into Arabic by Dr. Mohamed AbuShaira from Jordan and Saudi Arabia, and Mohamed Ali Balti from Tunisia, into Slovenian by Edi Strouhal and other translations exist as well.

A3i SW Manuals for specific sign languages

'Escrita de Sinais' is a manual of SW LIBRAS (Brazilian Sign Language) (Barreto and Barreto, 2012). It is an instruction manual for the writing of a specific language. "It brings a collection of 111 handshapes used in Libras (Brazilian Sign Language). This is the biggest list of handshapes for Libras. The previous publications by other researchers indicated 64 handshapes and the publications that followed 75 handshapes. The most accepted and used as a reference is still the list of 64 handshapes." (Barreto Madson, personal communication, 2012, August). Unlike previous manuals for LIBRAS, in this book LIBRAS is written vertically and not horizontally.

Parkhurst and Parkhurst (2008, pp. 131-142) have created a manual for Spanish Sign Language. Their manual is different from Sutton's manuals on the grounds that they describe here:

> This course primarily focuses on the *phonetics* of writing rather than the *phonology*. In other words, we focus on details of a sign and not on how to simplify the writing to reflect the system of a particular language. For example, in many languages there may not be a meaningful distinction between a handshape with the thumb extended and the same handshape with the thumb folded over. However, here we will teach all

> the symbols and leave the task of consolidating non-distinctive symbols for the phonologists and literacy specialists. (Parkhurst & Parkhurst, 2008, p. i.)

Two other manuals produced are by Ingvild Roald (2007) *Kurs i Tegnskrift (Self-study Guide for Learning Signwriting)* for Norwegian students of SW and Wöhrmann (2005) has also produced a manual for the SW of German Sign Langauge. There is a LIS SW Manual created by Di Renzo et al. (2011).

A4 SW IN ACADEMIC PUBLICATIONS

Hoffmann (2008) uses SW for transcriptions of Nepali Sign Language. She is one of the first researchers who has been allowed to publish SW in journals. Hoffmann-Dilloway's (2008) article contains SW in the text and it also has an online supplement with longer SW transcripts. Hoffmann-Dilloway's (2011) article discusses SW and therefore contains SignWritten material. It also contains an online supplement with video. In both cases these were the first articles either journal had ever published with SW in them. These two journals *Language & Communication* and *Journal of Linguistic Anthropology* accepted the use of SW. Another journal refused to print SW transcripts (Hoffmann-Dilloway, personal communication, May 2012).

SW is making its way into further academic research. Within the field of sign linguistics Van der Hulst and Channon (2010) have used SW as transcriptions of data. In the TISLR (Theoretical Issues Sign Language Research) conference three papers were accepted that are related to SW. Petitta and Di Renzo (2013) discuss the use of

SW for transcriptions of LIS (Italian Sign Language). Fagundes de Brito and Vanzin (2013) discuss the use of subtitles using SW. Finally Chiari, Di Renzo, Petitta and Rossini (2013) have used SW as one method for segmentation of continuous signing.

A5 SW DICTIONARIES

Dictionaries are another area that shows the expansion of SW. There are dictionaries that are compiled and published using SW (cf. Azzopardi-Alexander, 2003, 2004; Capovilla & Raphael, 2004a, 2004b, 2005a, 2005b, 2005c; Ferrerons, 2011) and there is a set of dictionaries that has used SW and glosses or pictures (cf. http://www.signwriting.org/archive/docs2/sw0111-US-PictDict-ASL-Eng.pdf) available on the web (see http://signbank.org/dictionaries/).

Between 1999-2003 the Flanders Sign Language Dictionary was compiled online. It can be found at http://gebaren.ugent.be/ . At Ghent University the project *Sociolinguistic Research of Flemish Sign Language* was carried out and financed by the BOF (Bijzonder Onderzoeksfonds/ Special Research Fund) (B/00056 - BOF/2-4/BOF2002). This project made it possible to create an electronic version of this dictionary. The project set out to develop a sign language dictionary in book and electronic form and in doing so support the education of the lexicon of Flemish Sign Language. The first part of the research was carried out by Kristof De Weerdt and Eline Vanhec who started work in 1999. In June 2003 Katrien Van Mulders took Eline's place. Prior to this work Flanders had no dictionary of Flemish Sign Language, not in book form, nor on the internet.

Johnston (2003) states that dictionaries help standardize a language and discusses the problems of not having a writing system. He adds that for spoken languages, dictionaries may be written by means of the IPA and that sign language does not have this:

> At an absolute minimum, speakers can use the International Phonetic Alphabet (IPA) to transcribe lexical items in the undescribed language, and then they can use a second language and its written form to describe the meaning and function of the listed words. The result is a unidirectional bilingual dictionary that documents the lexicon of the undescribed language. Anthropologists, ethnographers, and linguists have often produced this type of dictionary as a documentary resource and as a basis for further language study. Most lexicographers also propose some kind of dedicated script in order to write the language down in a way that reflects its phonological and morphological forms. In other words, one of the first steps in preparing most dictionaries of face-to-face languages, and especially a dictionary that is intended for community use, is to devise a dedicated writing system" (Johnston, 2003, p. 435).

A6 SW USED IN EDUCATION

SW has been and is used for teaching Deaf children with the support of the SW Literacy program of the DAC (Deaf Action Committee), so there are unpublished reports from teachers that discuss its use and relevance in education. Some of these

reports can be found on the SW website at

http://www.signwriting.org/forums/teachers/

The SW Literacy Project began in 1999, by developing four “SW Learning Levels” for teaching children. These levels were published as ASL storybooks (Sutton, 1996). These books were then donated to teachers in the Albuquerque Public Schools. Dr. Cecilia Flood, at the University of New Mexico, wrote her dissertation on the experience of teaching Deaf children using SW there.

In another school, teachers at the Hodgin Elementary School documented positive experiences. Children gained pride in learning both ASL and English because now there was a way to write both languages.

Other schools requested the same materials and joined the SW Literacy Project. Free donations of SW books and software for the use of SW in education are provided for teachers (Sutton and Frost, 2008).

A few more schools that are involved in the SW literacy programme are the Santa Maria-Rio Grande do sul in Brasil, Escola Estadual de Educação Especial. The teacher is Sonia Messerschimidt. In New Mexico there are the Albuquerque Public Schools and the New Mexico Hearing Impaired Programs that use SW in three Schools. Cecilia Flood conducted her study at Hodgin Elementary School.

Ingvild Roald in Norway used SW to write Physics teminology with and for her students[61]. In such a case SW is being used as a notation. However, it is used and read by Deaf students, therefore it is also used as a writing system.

The Nicaraguan project is a clear example where the researchers Judy and James Kegl have used SW in the education of the Deaf and have created many literary texts that can be easily read by children. Gangel-Vasquez's (1998) study does not reveal which characteristics might determine rapid or successful acquisition of literacy among the Deaf of Nicaragua, but it did show that, with training, many can learn the basics of reading. Further, there is evidence that achievement of "sign literacy" possibly opens the door to literacy in a spoken language.

Another significant finding has been made by Abushaira (2007) who studied signing Deaf children at the Al-Amal School for the Deaf, in Jordan in 2006-2007, and in the Alqasseem-Boraydah Deaf Children Institute in Saudi Arabia in 2002. His Deaf participants were placed in two groups. One group (the control group) was taught science without a written form for their native sign language, and the other group had the aid of SW while studying science. Abushaira (2007)'s findings show that the group that used SW improved and gained higher test scores by a wide margin.

One important work that looks at SW as an educational tool is Flood's (2002) PhD dissertation. Flood (2002) deals with the cognitive and psychological aspects of having a writing system for sign language. She recommends the creation of bi-literate programs for the Deaf and Hard of Hearing so that they may learn to read

[61] http://www.signwriting.org/forums/linguistics/ling032.html

and write in their sign language, using SW, and also learn to read and write the spoken language of their country. Her findings point to major benefits for Deaf education. They indicate that having a writing system for Deaf children's first language has a psychological benefit. It leads to higher self-esteem, which ultimately leads to better educational results.

Hoffmann-Dilloway (2013) has described how Wöhrmann uses his adaptation of SW for the needs of his students and as bridge to learning the spoken language. Stefan Wöhrmann is a teacher for the Deaf in Germany. He has produced *GëbardenSchrift* and Mundbilder. Mundbilder has adopted SW symbols to represent the mouth patterns of spoken German. Using SW for a specific aim ultimately results in adapting SW symbols to reach that aim. This is similar to what happens in the evolution of a writing system towards an orthography – the writing system is used according to the needs of a specific language and adaptations for a specific aim: to teach deaf students the spoken language. This is an important development in SW, since this teacher has moved beyond the use of SW simply as a notation and has applied SW to the educational needs of his students and has thus created a specific resource from SW.

A7 SW AND MACHINES

Finally another major field of interest is the application of SW to machines for editing SW (Slevinski, 2012), for unicode purposes, machine translation (cf. da Rocha Costa and Dimuro, 2001), and search tools that make it possible to search for signs in

dictionaries using SW rather than the spoken/written words (cf. Aerts, Braem, Van Mulders and De Weerdt (2004).

In this section only a brief mention of the work is presented. Researchers working in machine-based translations for sign languages are now at a stage where they acknowledge SW (cf. Morrissey and Way, 2005). Some researchers are investigating the possibility of advancing in technology for sign language using SW (Bouzid & Jemni, 2013a; 2013b).

A doctoral dissertation on SW was carried out by Aznar (2008). His dissertation is about SW and Unicode.

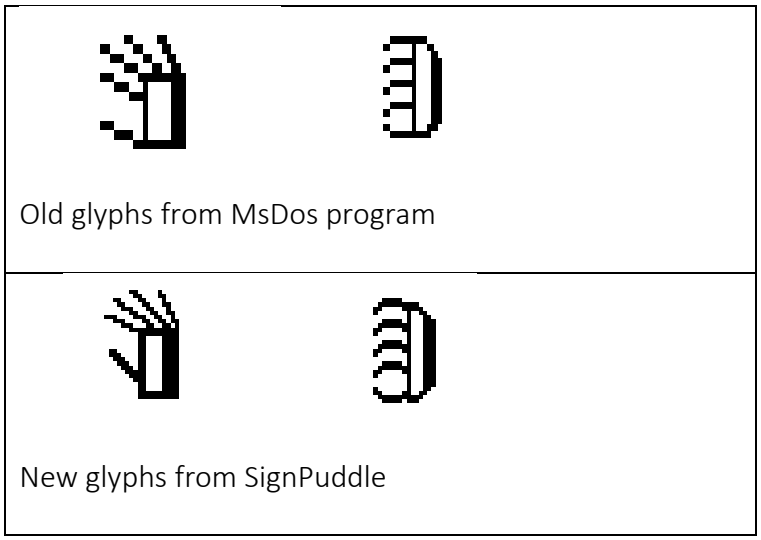
There are however others who avoid investigating further into the system. Morrissey and Way (2005) give an unfounded reason for their rejection of SW: "Another issue with SignWriting is that the majority of signers are unfamiliar with it which lowers its appeal for use as final output translation" (Morissey & Way, 2005, no page no., Section 1). Also their description of SW as lacking "explicit linguistic detail necessary for the generation of signs using an avatar" (Morissey & Way, 2005, no page no., Section 1) is not grounded in any documentation/research (Slevinski, personal communication, March 2012).

A7i Software Programs

There are also software programs that have been developed over the years. In 1986, Richard Gleaves developed the first software for SW: a program called

SignWriter. It later became SignWriter DOS in MS-DOS and SignWriter Java (Slevinski, 2012, p. 8). All these old programs are free to download (www.signwriting.org). SignWriter DOS was convenient and many users found it very good for editing signs. The most convenient aspect of this program was that SW was inputted using a keyboard. SignWriter DOS had the disadvantage that the SW glyphs had a low amount of pixels. Today the glyphs are much sharper and clearer (see Figure 1a below). Another disadvantage of SignWriter DOS is that SW text could only be written horizontally whereas today with SignPuddle 2.0 both vertical and horizontal layouts are possible.

Figure A1. SW Glyphs from old and new programs



SignPuddle Software has been created by software designer Steve Slevinski, who collaborated with Valerie Sutton, starting in 2004. The Slevinski- Sutton collaboration is ongoing. The latest version SignPuddle v2.0 was launched in April 2012. The first

ever version was SignPuddle v1.0. Version 1.5 was second and included the SignText feature using the ISWA 2008. Version 1.6 was third and included the ISWA 2010.

SignPuddle can be found at: http://www.signbank.org/signpuddle . This program is used for creating dictionaries and documents in SW. Users input SW directly on the web. The freedom of posting signs and text, in a Wikipedia-like fashion, is causing widespread use of SW all over the world. Sutton and Frost (2008, p. 3) claim that "thousands of people from some 40 countries use SignPuddle Online on a regular basis for their students and signing communities." Exact statistics are unknown (Valerie Sutton, personal communication, March 2012) and Hoffmann-Dilloway (2011) is more cautious when describing the spread of SW:

> Small but growing networks of signers in over thirty countries use SW for a range of purposes, including writing notes, pedagogical materials, poems, novels, newspapers, and blogs in their respective sign languages, while some scholars have adapted the system for notation purposes in sign language research. (p. 345)

SignPuddle 2.0 includes Sutton's International SW Alphabet (ISWA 2010), and has a SW MediaWiki Plugin. The SW Image Server (SWIS) makes it possible for programmers to use SW on their websites. The source code for the software, and the complete ISWA symbols, can be downloaded on SourceForge, under the GPL and OFL licenses (Sutton & Frost, 2008).

One shortcoming of using SignPuddle 2.0 in that during text writing, signs stored in a database cannot be inserted into the text. This feature would make sign text writing

much faster. Unlike SignWriter DOS SignPuddle uses the mouse that clicks-and-drags glyphs into a small palatte. In this palatte using the mouse the symbols may be moved around to form a whole SignWritten sign and finally it is inserted into a vertical column with the choice of center, right or left placement. After this process the text is saved and stored in SignPuddle 2.0 online.

SW has evolved since its invention in 1974 (see also Chapter 2). Changes have been made across the years. It has seen changes in glyphs due to changes in the software programs that were used to edit SW and thus glyphs changed accordingly. Also additional glyphs have been added to ISWA 2010 through past feedback from the users of SW for different languages distinct from ASL.

A7ii Swift

Swift is another editing program created by a team of linguists and programmers in Italy. The Swift program resembles the layout of SignPuddle (Bianchini, Borgia & Marsico, 2012). A link to this program is http://151.100.17.44/SWift/

A7iii DELEGS

DELEGS is a German acronym standing for "Learn German assisted by SW". The DELEGS program started as an educational tool for German deaf people who wished to improve their literacy in the German language. DELEGS allowed these German deaf people to use their skills in German sign language to improve reading and writing in German.

Today DELEGS supports other sign languages including American Sign Language (ASL), Lenguas de Signos Española (LSE), Língua Brasileira de Sinais (Libras), and their

corresponding spoken languages of English, Spanish and Portuguese. DELEGS is continuing to develop to create more educational tools based on SW.[62]

A7iv SignWriter Studio

SignWriter Studio[63] is a freeware program developed by Jonathan Duncan and released in June 2013, to provide an easier starting point for beginners who are learning SW and a faster way to write and share sign languages.

It was first created as a way to print out lists of signs to help people learn sign language vocabulary. Later SW glyphs were added to the program. Now SignWriter Studio has a large set of features including the possibility of storing favourite glyphs to access them quickly when writing, full keyboard and mouse support, and sign search by glyph or gloss in the dictionary. It uses the ISWA 2010 glyph-set and is compatible with SignPuddle. SignWriter studio also contains a dictionary where separate signs can be saved and then added to text documents.

A7v SW to HamNoSys Converter

Penny Boyes-Braem is working on a project to create a SW to HamNoSys converter. Several discussions about this work are available on the SLLING-L Email List SLLING-L@listserv.valenciacollege.edu

[62] Information retrieved August 217, 2013 from http://www.delegs.com/DelegsPage/#us_uk
[63] Information retrieved August 27, 2013 from http://www.signwriterstudio.com/about.htm

A7vi Apps of SW

One known app for SW was created by Jake Chasan of JApp Design who collaborated with Elena Eroshkin and Adam Frost. The SW App is intended to help students learn ASL vocabulary with SW, illustrations and quizzes.

A7v SW Wikimedia, Blogs and Social-Networks

SW has an open project on Wikimedia Labs. The ASL Wikipedia Project is an on-going project. Steve Slevenski is the administrator of the SW project.

> In general, Wikimedia Labs creates virtual computers running Linux. They use a special tool called Puppet to configure the virtual servers. Wikimedia Labs allows you to create, manage, and analyze the virtual servers through a MediaWiki based application. Wikimedia Labs is deeply integrated but not always configured properly or documented. (Slevinski, http://tools.ietf.org/html/draft-slevinski-signwriting-text-01 5.3.2)

Adam Frost is the ASL editor of the SW Wikimedia that can be found here: http://ase.wikipedia.wmflabs.org/wiki/Main_Page . This wikimedia is the only known SW wiki available and is still in its early stages. However Steve Slevinski reported that the ASL wikimedia is now available in 'Incubator'. New test Wikipedia projects usually start on the Wikimedia Incubator and having the ASL project available on the Incubator is a major step forward (Slevinski, August, 2013, personal communication).

Steve Slevinski (2012) answered to an interview about the development of Wiki for SW. This interview has also been mentioned in a Wikipedia technology report: http://en.wikipedia.org/wiki/Wikipedia:Wikipedia_Signpost/2012-06-04/Technology_report and Slevinski states this:

> The best way to improve the literacy in a community is to have a lot of people reading and a lot of people writing. It is my hope that a Wikipedia in a sign language would give a community an easy way to share and improve their writing. More people reading. More people writing. Writing that improves and matures over time. It's a win-win all around." (June 2, 2012, http://blog.wikimedia.org/2012/06/01/towards-a-wikipedia-for-signed-languages/).

Adam Frost has also gathered a list of blogs that mention and use SW. A list of these blogs can be found here: http://www.signwriting.org/blogs/

SignWriting is also beginning to make its way into social networks. Madson Barreto is the administrator of the Facebook page '- Brasil' and members of this Group post SW and hold discussions about the SignWriting writing system for Brazil on this Facebook page http://www.facebook.com/librasescrita (retrieved 20/08/13). Other known Facebook network pages related to SW are: http://www.facebook.com/pages/SignWriting-for-Sign-Languages/354367874601038 ; Valerie Sutton's facebook page

http://www.facebook.com/SignWriting and the Tunisian SW Facebook forum at http://www.facebook.com/forumtunisiendesingwriting

A7vi Machine-Based Translations and SW

Da Rocha Costa and Dimuru (2001) have presented the idea that SW could be used for computer processing since the turn of the century. In Morrissey and Way's (2005) article the excuse for not delving further into SW is by an overgeneralised statement and one not grounded in any documentation/research (Slevinski, personal communication, March 2012). They state the following:

> SignWriting may fill this gap as there are SL corpora available in this form. In terms of its suitability as a candidate for use in an EBMT system, SignWriting lacks the explicit linguistic detail necessary for the generation of signs using an avatar. Annotated corpora on the other hand have the potential to carry varying degrees of granularity of linguistic detail, therefore bypassing the need to translate using SignWriting and then deriving such details from the resulting SignWriting symbol. Another issue with SignWriting is that the majority of signers are unfamiliar with it which lowers its appeal for use as final output translation. (Morrissey & Way, 2005, 3.2)

In a later study one of the researchers, Morrissey (2008), mentions SW as a possible notation system to use for machine translations between spoken language and sign language. Almasoud and Al-Khalifa (2011) have introduced the use of SW for a machine-based translation from Arabic to Arabic Sign Language.

A8 SW: MISCELLANEOUS

SW is also used as a theme for the novel 'A Handful of Spells', Shaw (2013). Although the author does not use the glyphs of SW in her novel, she uses the idea that SW is used for magical spells written in a spell book.

Another use of SW is for the card game for LIBRAS escrita. "The "Libras em Jogo" is a card game composed by 111 handshapes of Libras. The game contains a bilingual instruction manual (Portuguese/ Libras) using SW. Both the manual and the box of the game, all information is available in SignWriting." (Madson Barreto, personal communication, 2012, August).

A9 SW: GLOBAL DIFFUSION OF A WRITING SYSTEM

There is evidence today that SW is at a stage where its diffusion has come to a point where it is no longer contained. This is recognised by the inventor of the system, Valerie Sutton. Unlike in the past, where she would be aware of all use of SW, nowadays people are simply using SW without consultation with the inventor and she is discovering work that she had no idea was taking place. In fact she has also stated that most works on SW are unknown to her. Sutton is aware that this is a very positive sign of the diffusion of the system.

For instance, she was unaware until 2012 of the following publication of an article discussing the use of SW for Japanese Sign Language that was written four years earlier in 2008, (Kato, 2008). She was also unaware for a while about the SW Software Forum (Sutton, personal communication, August 2012). She placed this

information onto the SW website and it can now be retrieved at

http://www.signwriting.org/forums/software/

While writing this section on the diffusion of writing systems two emails came through the SW-List. One was by Lasse Schneider who announced the launch of an Apple app for DELEGS. This project was carried out by Hamburg University. Another project is that of Ronnie Fagundes de Brito who announced that his project of subtitles in SW for television is also on the way. These two projects were both unknown to the inventor of SW.

It may be impossible to figure out all the sign languages that use SW, since other forms of SW may be used. There may be sign languages that are using handwritten SW, others may be using different software programmes to edit and store SW.

During the writing of this work, the software program created by Bianchini et al. (2012) called Swift was brought to my attention by Steve Slevinski (the producer of SignPuddle, see Chapter 5, Section 5.2). This is another example that SW is diffusing globally. Although it is impossible to contain all the works in SW that have been carried out globally, SignPuddle (Chapter 5, Section 5.2) has helped to gather the works of several countries and each SignPuddle can be analyzed in order to understand its active use (see Chapter 5, Section 5.5).

A10 CONCLUSION

This Appendix is intended to show that SW is now at a stage where it is widespread and uncontained. Even listing known works is difficult because SW has spread into

different disciplines, such as that of computers, education and anthropology. SW is being used well beyond just a notation for linguistic studies of sign languages. It is being used to write sign language in the same way that alphabets, syllabaries and morphographies/logographies are used to write spoken languages. Even in basic sign linguistic text books by leading sign linguists in the field, SW is being acknowledged as a promising writing system for SL (cf. Johnston & Schembri 2007).

In a conversation with the creator of the system Valerie Sutton (March, 2012) she talked of how in the past the website was manageable since the works were fewer. Today it consists of over 3,000 webpages, and is difficult to maintain because of the amount of works in SW and about SW.

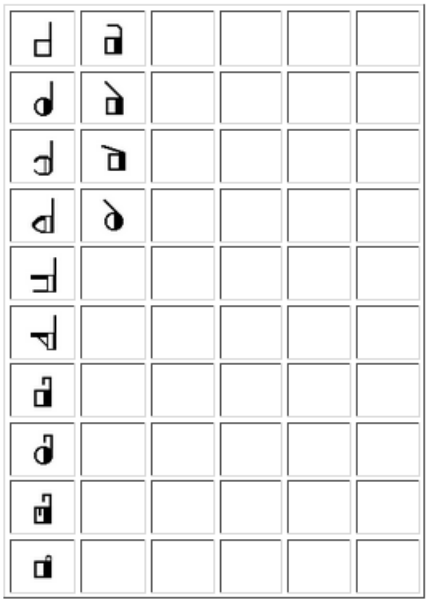
Additionally during this work, it was a challenge to keep up with the influx of new technologies for SW and other works related to SW. This proves furthermore that SW is becoming widespread, uncontainable and untraceable. In the same way that works written in and about a well developed writing system such as the Latin script, the time has arrived where SW is so widespread, that it is impossible in the same way to list all works that have been produced using this writing system and that have been written about this writing system. Thiessen (2011) says the following about SW:

> While the final decision to use or not to use a writing system rightfully remains with each sign language community, the undeniable fact is that they now have the option to write their sign language where before they did not. No longer can anyone say with honesty and integrity: “Sign languages cannot be written.” (Thiessen, 2011, p. xx)

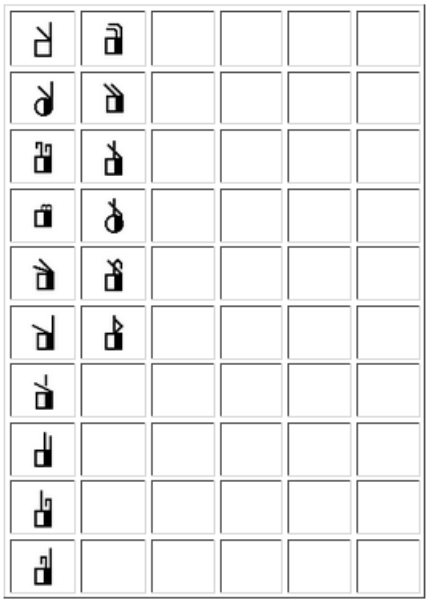
APPENDIX B: (ISWA 2010) SW GLYPH-SET (652 GLYPHS)

This appendix is provided to list the glyph-set of the ISWA 2010. The glyphs are referred to as 'BaseSymbols' and are all taken from Sutton (2011) with permission.

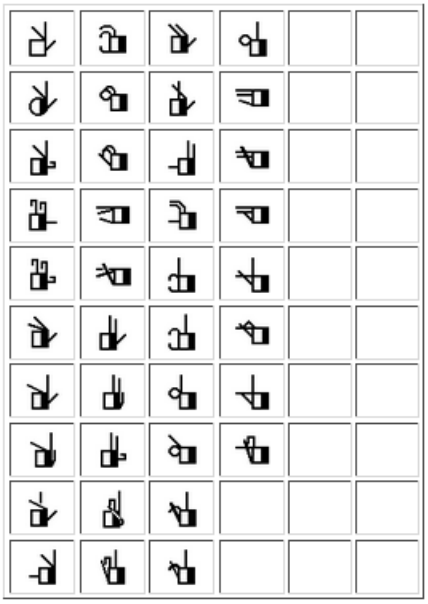
Group 1: Index Finger



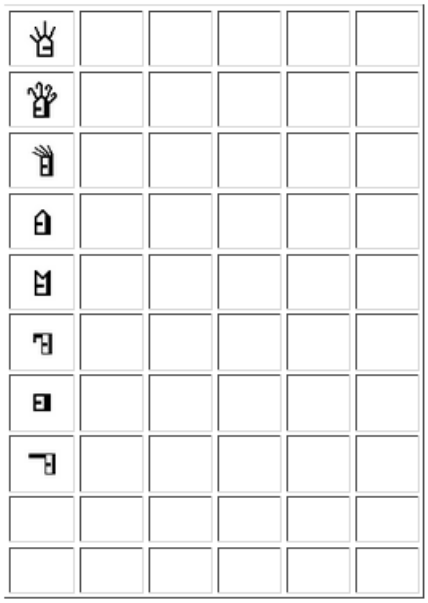
Group 2: Index & Middle Fingers



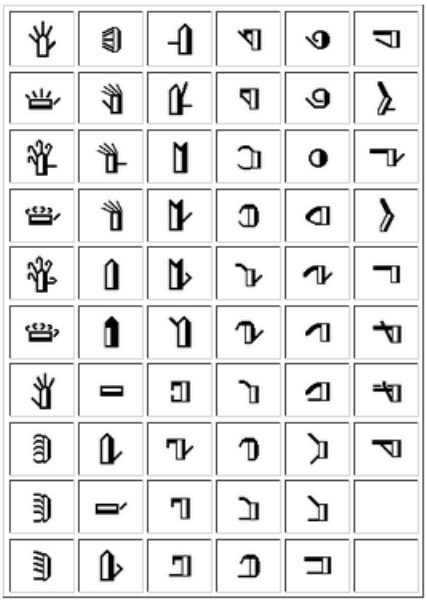
Group 3: Index, Middle & Thumb



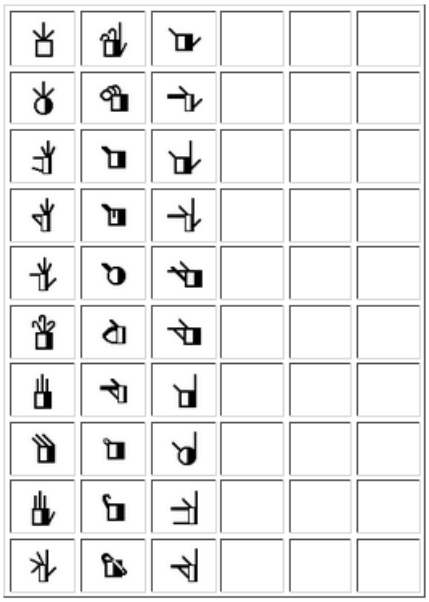
Group 4: Four Fingers



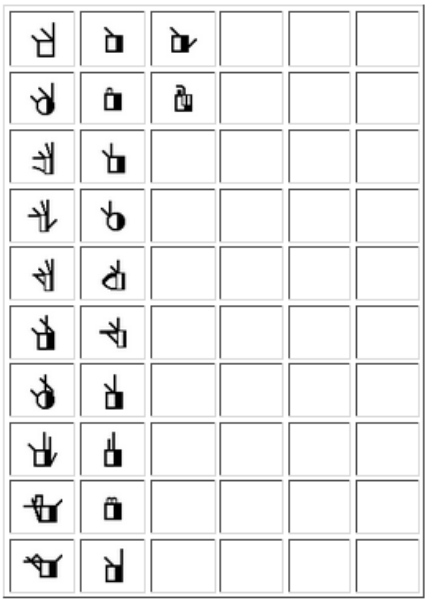
Group 5: Five Fingers



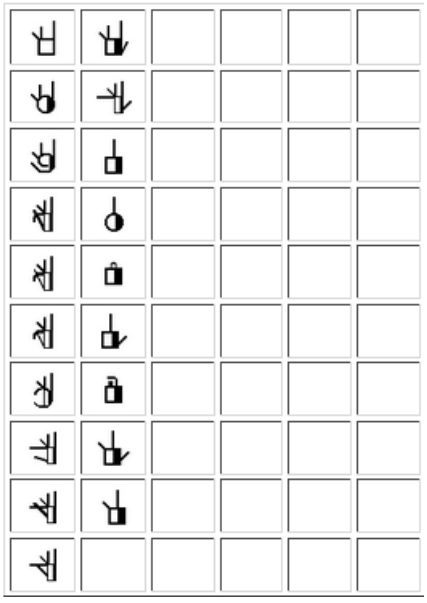
Group 6: Baby Finger



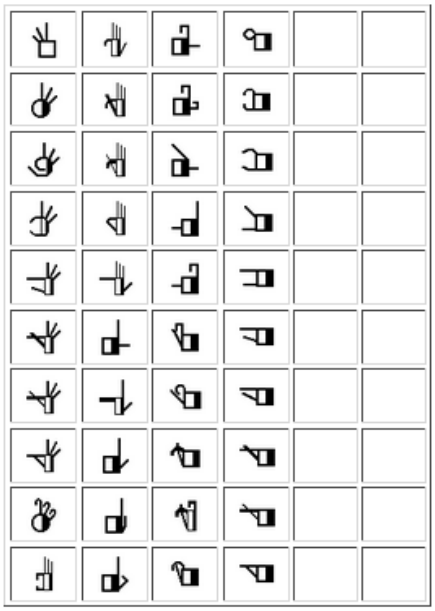
Group 7: Ring Finger



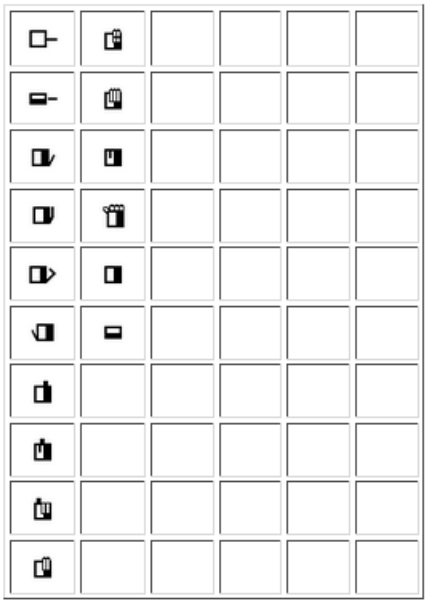
Group 8: Middle Finger



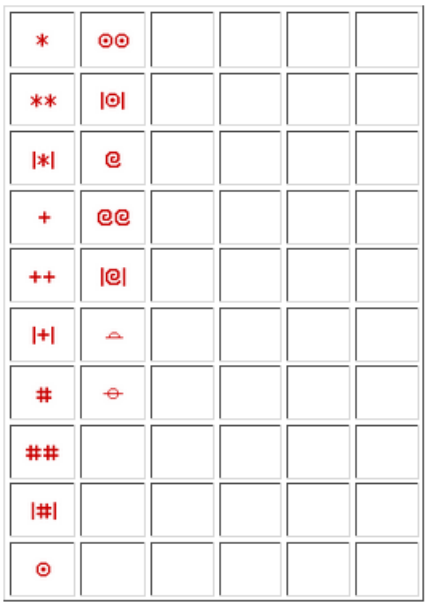
Group 9: Index & Thumb



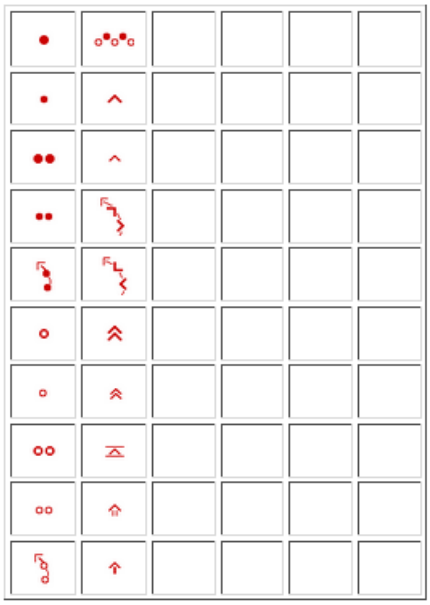
Group 10: Thumb



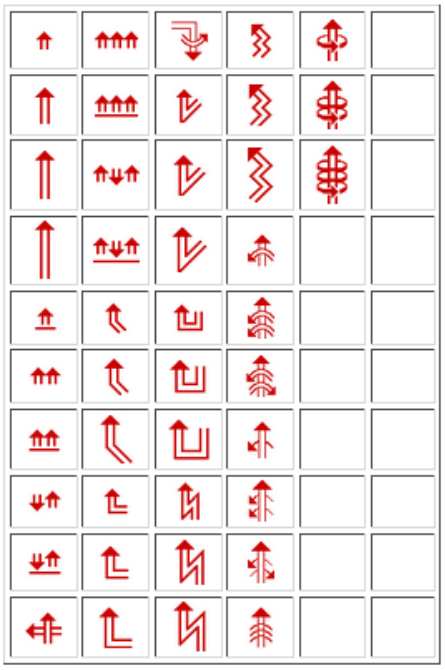
Group 11: Contact



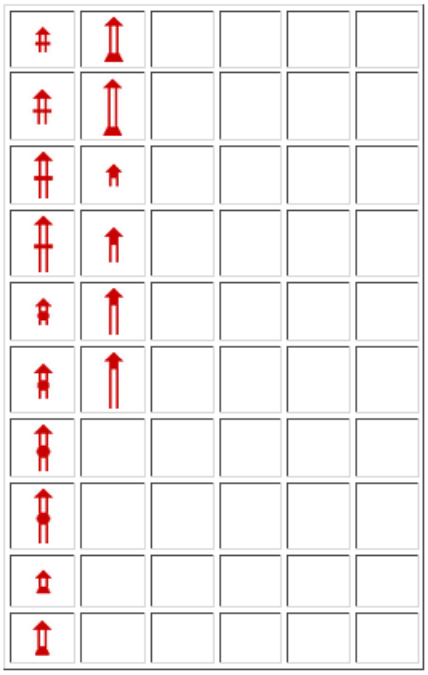
Group 12: Finger Movement



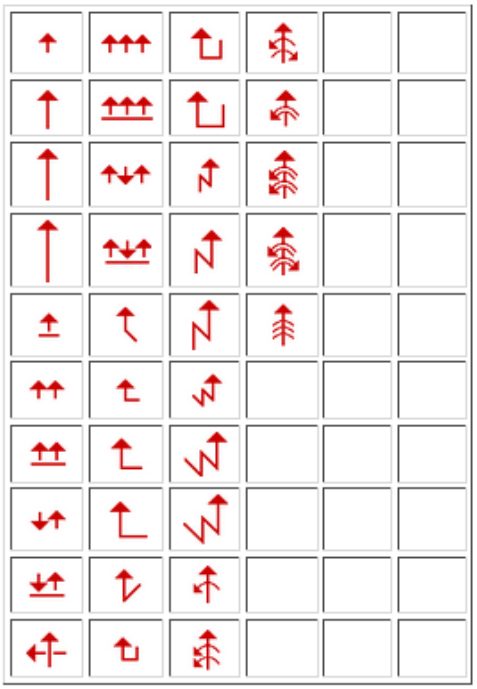
Group 13: Straight Wall Plane



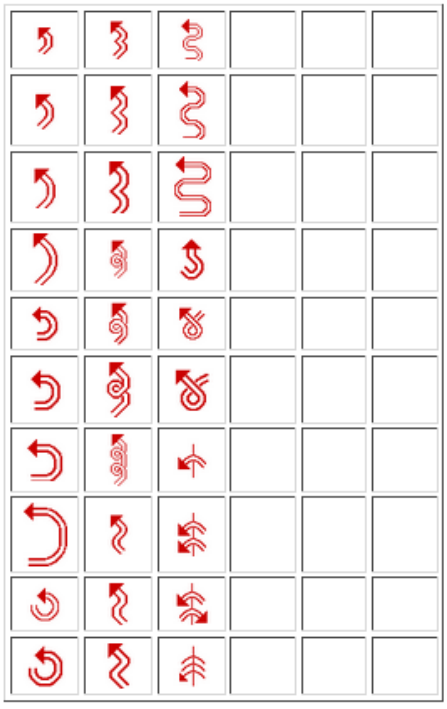
Group 14: Straight Diagonal Plane



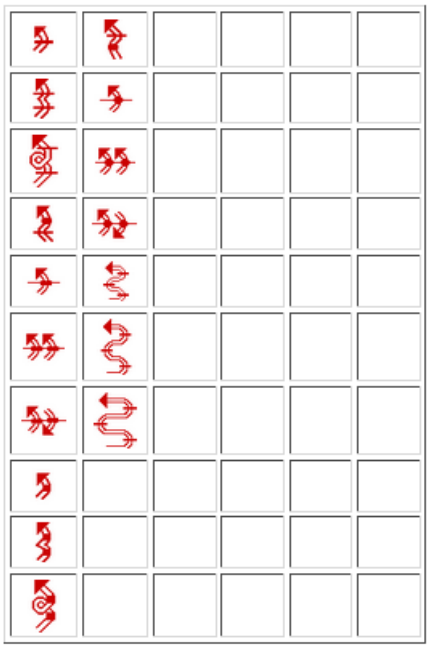
Group 15: Straight Floor Plane



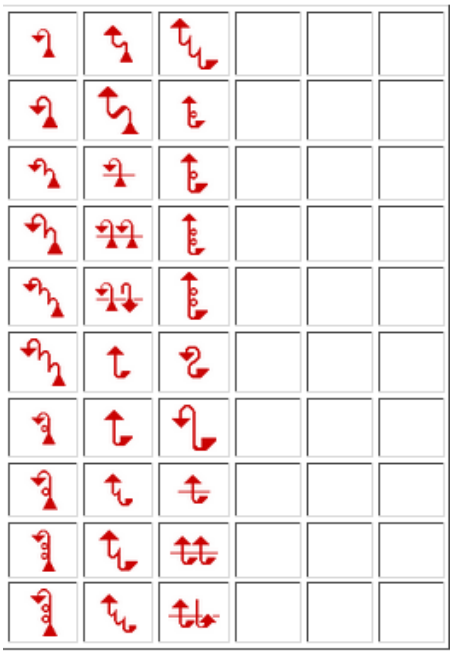
Group 16: Curves Parallel Wall Plane



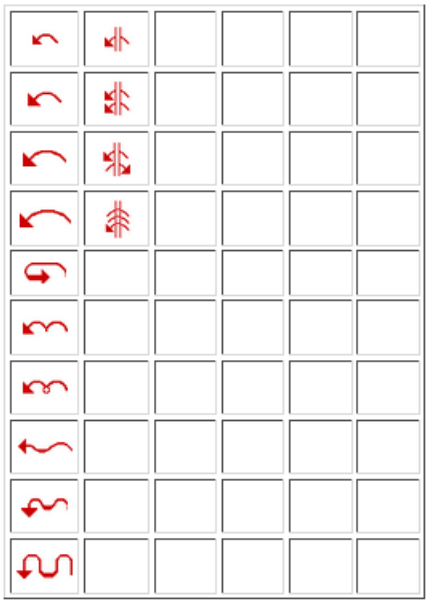
Group 17: Curves Hit Wall Plane



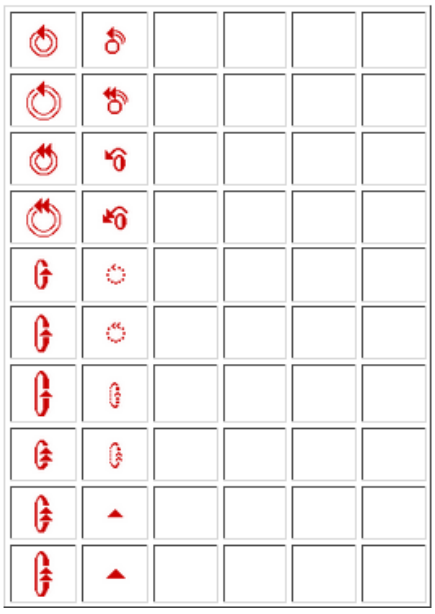
Group 18: Curves Hit Floor Plane



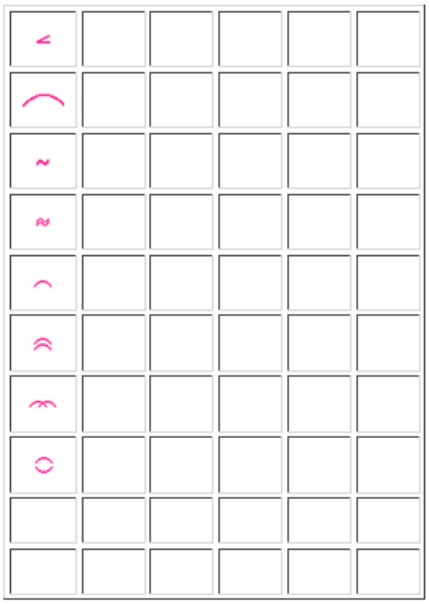
Group 19: Curves Parallel Floor Plane



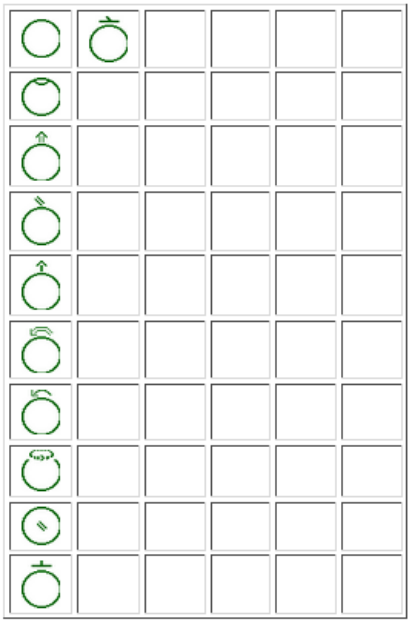
Group 20: Circles



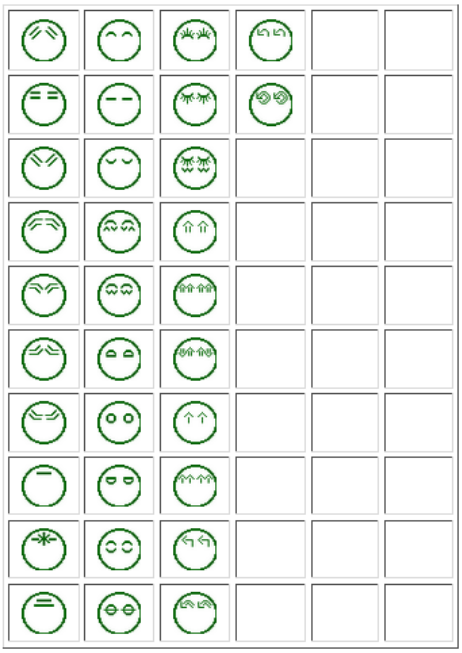
Group 21: Dynamics



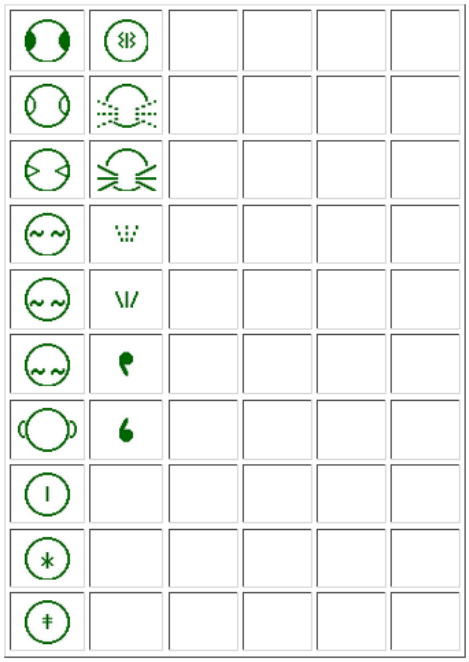
Group 22: Head



Group 23: Brow Eyes Eyegaze

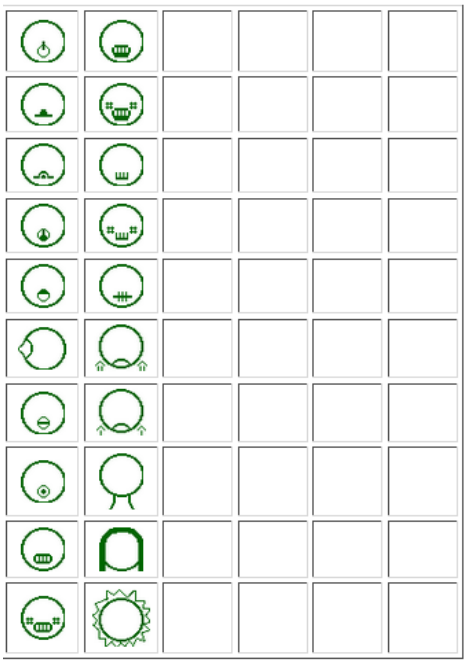


Group 24: Cheeks Ears Nose Breath

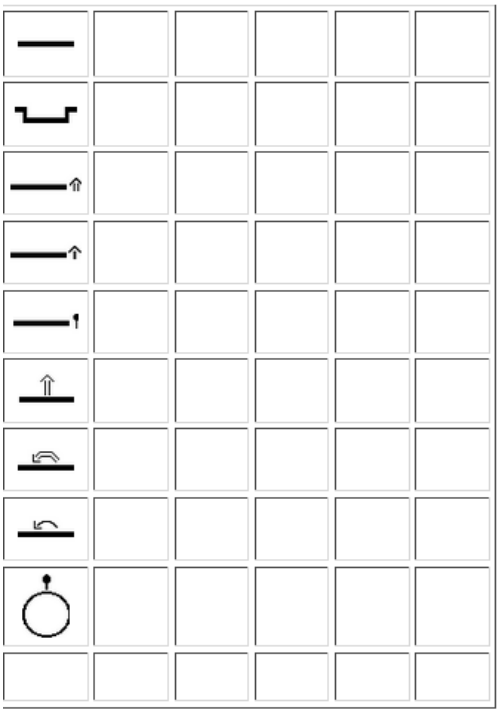


Group 25: Mouth Lips

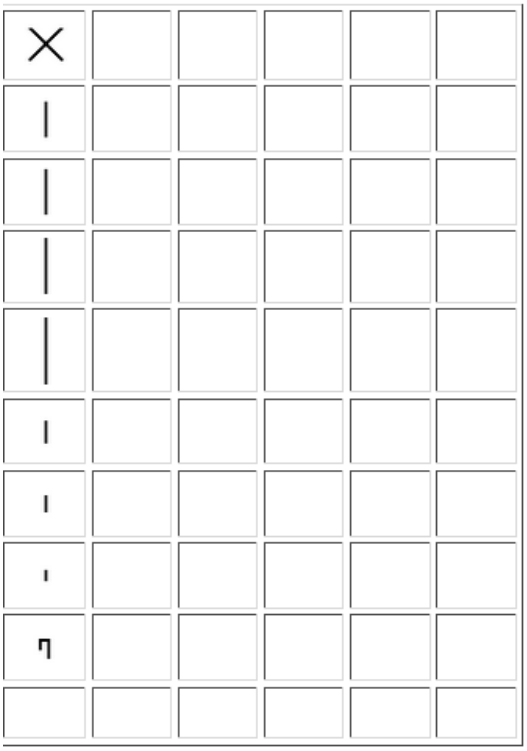
Group 26: Tongue Teeth Chin Neck



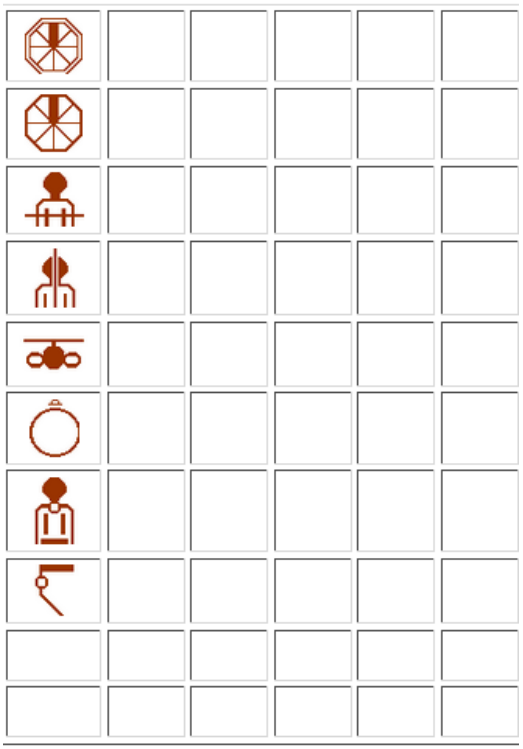
Group 27: Trunk



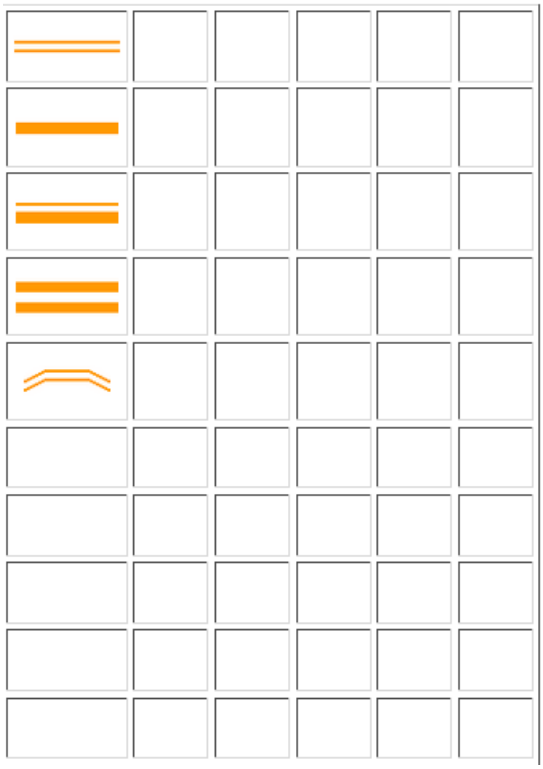
Group 28: Limbs



Group 29: Detailed Location



Group 30: Punctuation

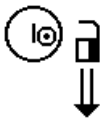


APPENDIX C: THE READING-QUESTIONNAIRE

The reading-questionnaire that was used in the study is found here below. There were more spaces between each question in the actual presentation of the questionnaire. Here it is 'compressed' for the sake of space. Additionally a few tick-boxes may be missing here. Once again this was done to save space.

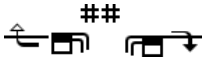
Exercise 1: Glyph-Preference

Liema tippreferi jew xorta? (Which do you prefer, or are they the same?)

1. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

2. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

3.a.  ☐ b.  ☐ c. Xorta (The Same) ☐

4. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

5. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

6. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

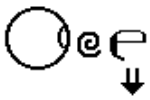
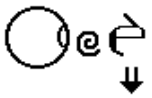
7. a. .  ☐ b.  ☐ c. Xorta (The Same) ☐

8. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

9. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

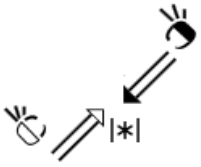
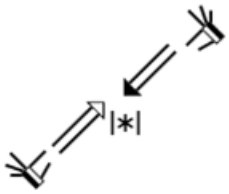
10. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

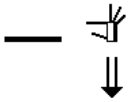
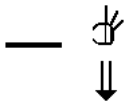
11. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

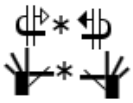
12. a.  ☐ b.  ☐ c. Xorta (The Same)

13. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

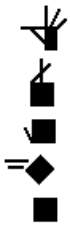
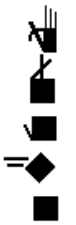
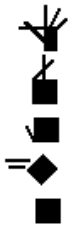
14. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

15. a.  ☐ b.  ☐ c. Xorta (The Same)

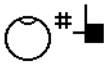
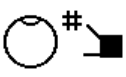
16. a.  ☐ b.  ☐ c Xorta (The Same) ☐

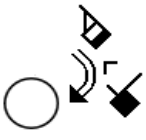
17. a.  ☐ b.  ☐ c.  ☐

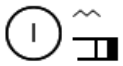
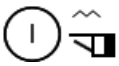
d. Xorta (The Same) ☐

18. a.  ☐ b.  ☐ c.  ☐

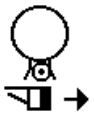
d. Xorta (The Same) ☐

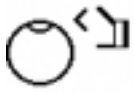
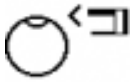
19. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

20. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

21. a.  ☐ b.  ☐ c.  ☐

d. Xorta (The Same) ☐

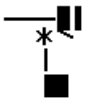
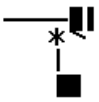
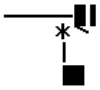
22. a.  ☐ b.  ☐ c.  ☐ d. Xorta (The Same) ☐

23. a. .  ☐ b.  ☐ c.  ☐

d. Xorta (The Same) ☐

24. a.  ☐ b.  ☐ c.  ☐

d. Xorta (The Same) ☐

25. a.  ☐ b.  ☐ c.  ☐ d.  ☐

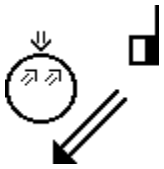
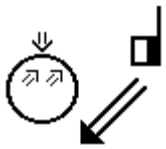
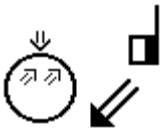
e. Xorta (The Same) ☐

26. a.  ☐ b.  ☐ c.  ☐ d.  ☐

e. Xorta (The Same) ☐

27. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

28. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

29. a.  ☐ b.  ☐ c.  ☐

d.  ☐ e. Xorta (The Same) ☐

30.a.  ☐ b.  ☐ c.  ☐ d.  ☐

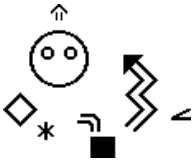
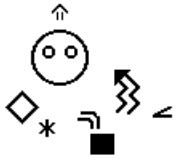
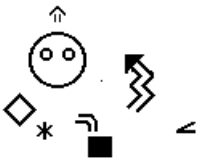
e. Xorta (The Same) ☐

31. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

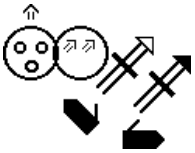
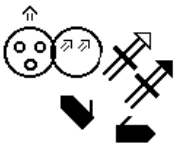
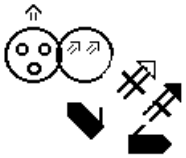
a  ☐ b.  ☐ c. Xorta (The Same) ☐

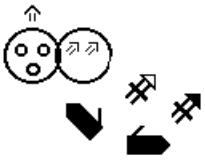
a .  ☐ b.  ☐ c.  ☐

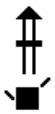
d. Xorta (The Same) ☐

34 a.  ☐ b.  ☐ c.  ☐

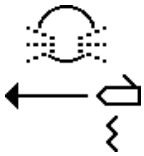
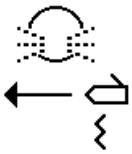
d. Xorta (The Same) ☐

35. a.  ☐ b.  ☐ c.  ☐

d.  ☐ e. Xorta (The Same) ☐

36. a  ☐ b.  ☐ c.  ☐ d.  ☐

e. Xorta (The Same) ☐

37. a.  ☐ b.  ☐ c.  ☐

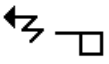
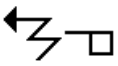
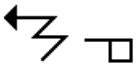
d.  ☐ e. Xorta (The Same) ☐

38. a.  ☐ b.  ☐ c.  ☐ d.  ☐

e. Xorta (The Same) ☐

39. a.  ☐ b.  ☐ c.  ☐

d. Xorta (The Same) ☐

40. a.  ☐ b.  ☐ c.  ☐

d. Xorta (The Same) ☐

41. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

42. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

43. a.  ☐ b.  ☐ c.  ☐ d.  ☐

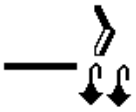
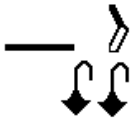
e. Xorta (The Same) ☐

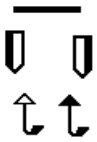
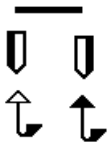
44. a.  ☐ b.  ☐ c.  ☐ d.  ☐

e. Xorta (The Same) ☐

45. a  ☐ b.  ☐ e. Xorta (The Same) ☐

46. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

47. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

48. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

49. a  ☐ b.  ☐ c.  ☐ d.  ☐

e. Xorta (The Same) ☐

50. a.  ☐ b.  ☐ c.  ☐

d.  ☐ e. Xorta (The Same) ☐

51. a.  ☐ b.  ☐ c.  ☐ d.  ☐

e. Xorta (The Same) ☐

52. a.  ☐ b.  ☐ c.  ☐

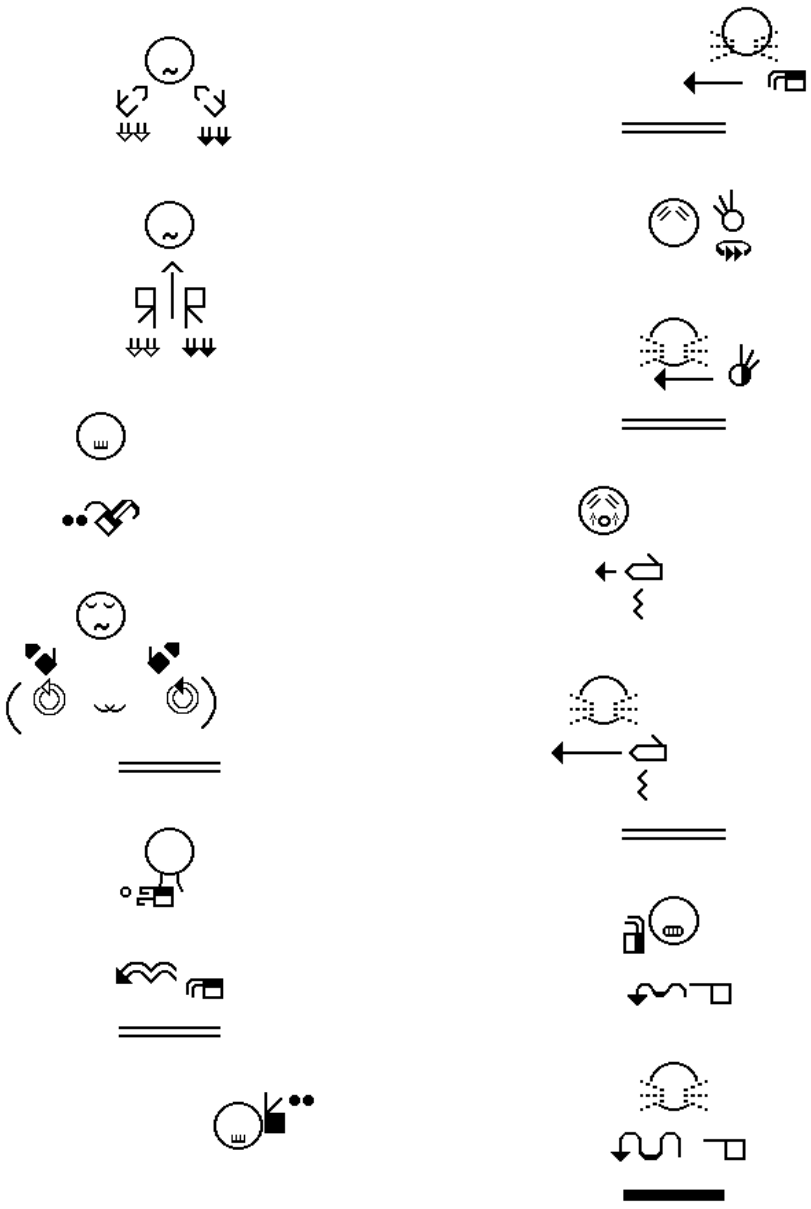
d.  ☐ e. Xorta (The same) ☐

53. a.  ☐ b.  ☐ c. Xorta (The same) ☐

54. a.  ☐ b.  ☐ c. Xorta (The same) ☐

Exercise 2: Word/Sign Boundaries

Immarka fejn tispiċċa kelma. (Please mark where the word ends)



Kummenti (Comments): -

_____

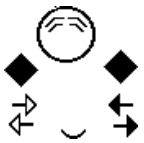
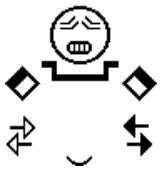
_____

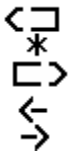
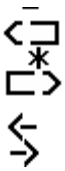
Exercise 3: Positioning of SW glyphs

Liema tippreferi jew xorta? (Which do you prefer, or are they the same?)

1. a.  ☐ b.  ☐ c.  ☐

d. Xorta (Same) ☐

2. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

3. a.  ☐ b.  ☐ c.  ☐ d. Xorta (The Same) ☐

4. a.  ☐ b.  ☐ c.  ☐ d.  ☐

e.  ☐ f.  ☐ g. Xorta (The Same) ☐

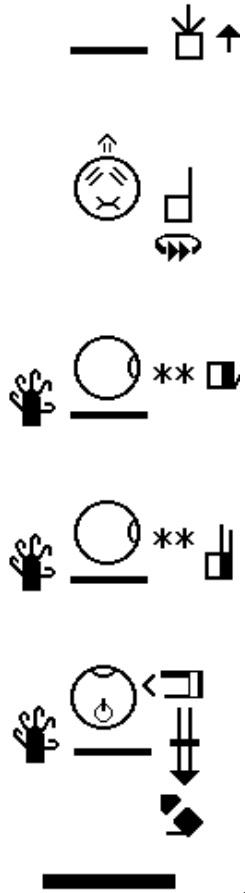
Kummenti (Comments)

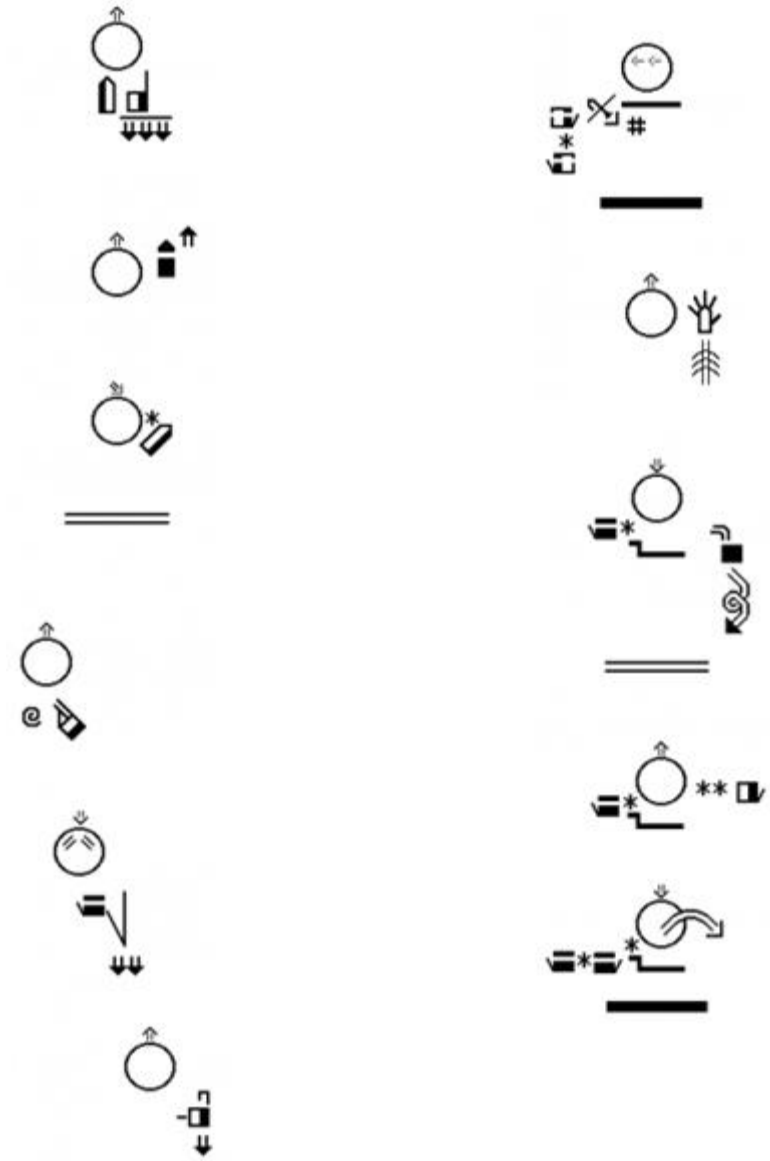
_____

_____

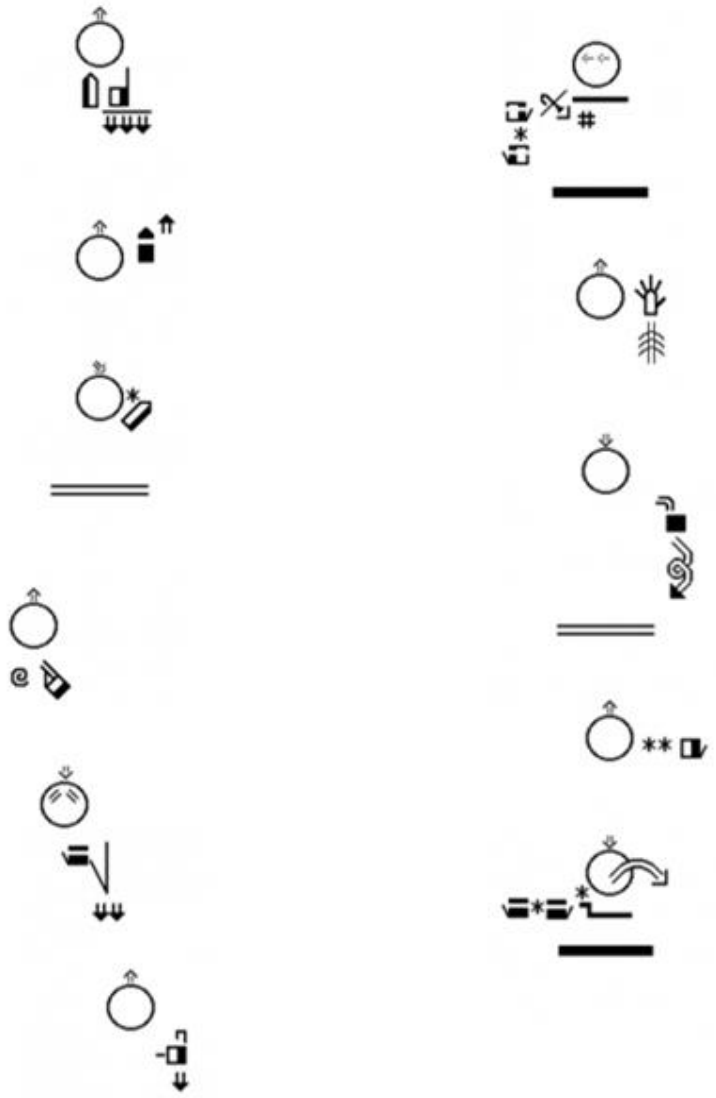
Exercise 4: SW LSM buoys

Liema sentenza tippreferi? (Which sentence do you prefer?)

1. a.  ☐ Jew (or)  b. ☐



2 a.



2 b.

Kummenti (Comments):

_____

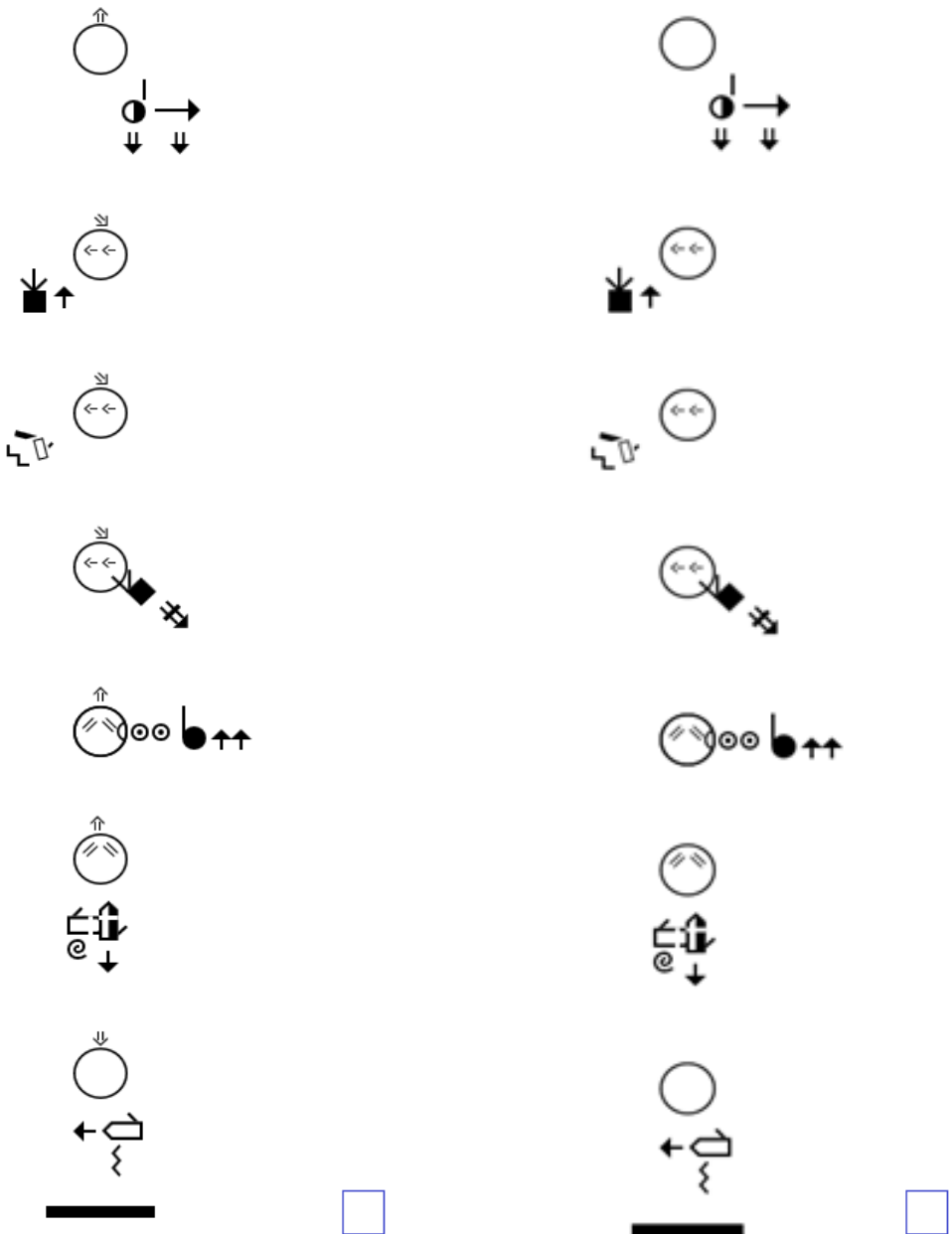
_____

_____

_____

Exercise 5: Head-tilt patterns (to include or exclude)

Liema sentenza tippreferi? (Which sentence do you prefer?)



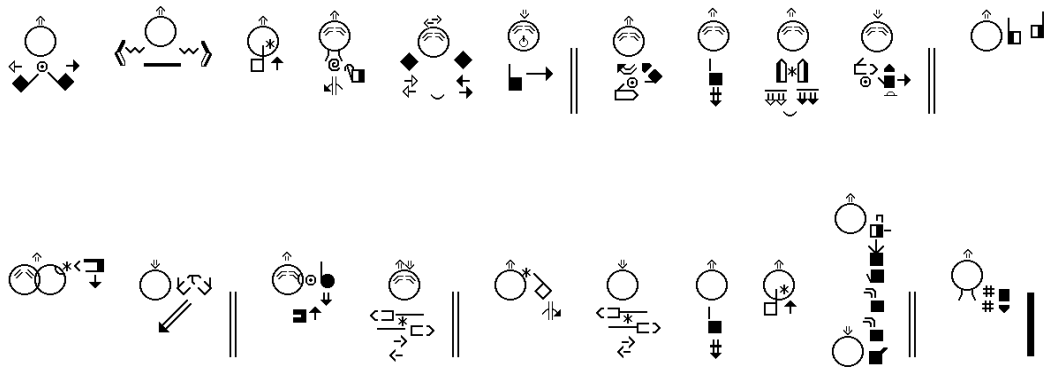
Jew (or)

Kummenti (Comments):

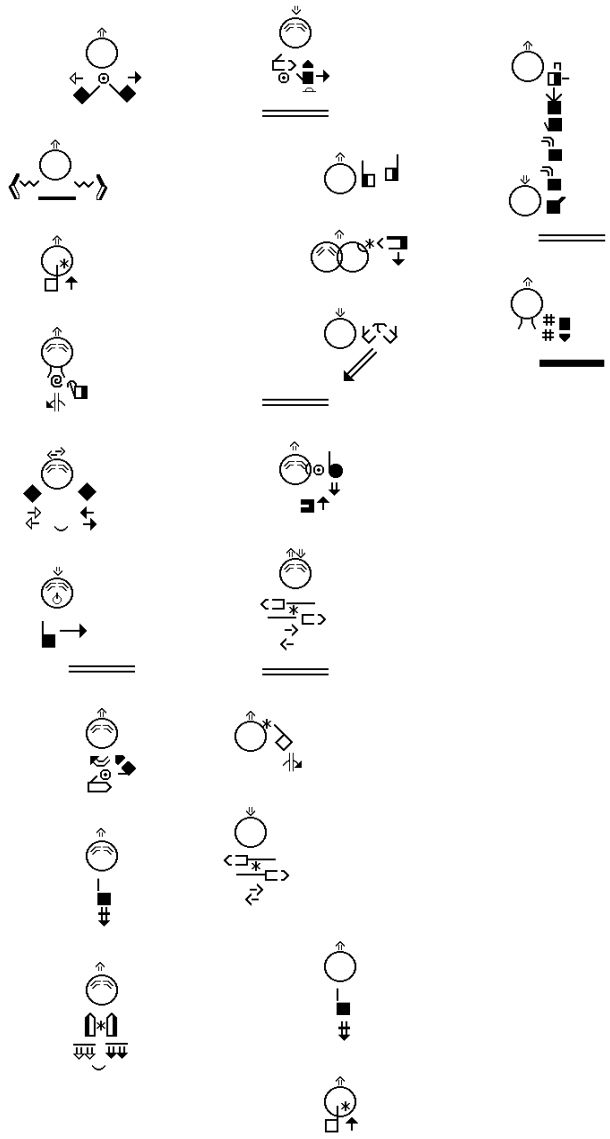
_____

Exercise 6: Horizontal vs. Vertical SW LSM layout

Liema sentenza tippreferi? (Which sentence do you prefer?)



1a. ☐ Jew (Or)

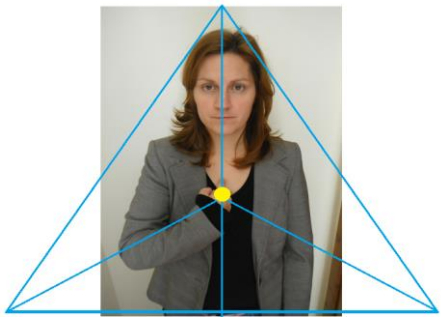
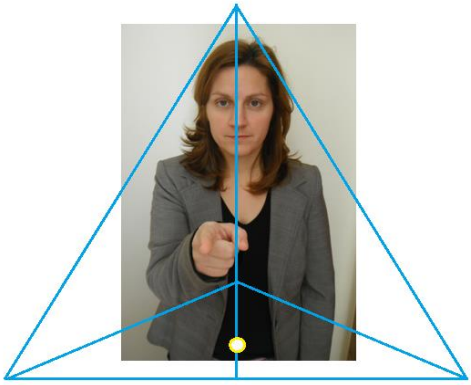
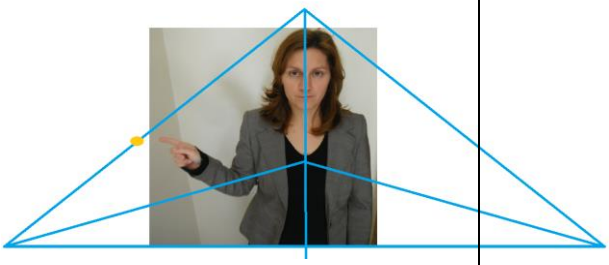


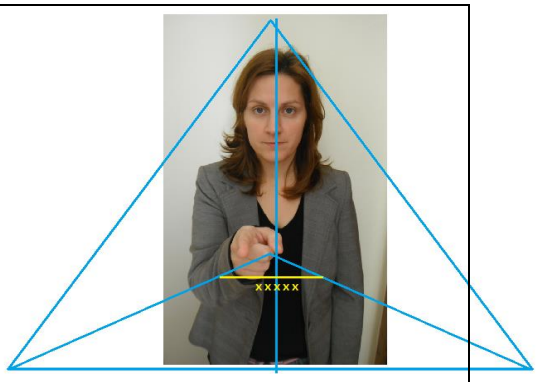
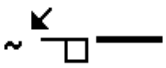
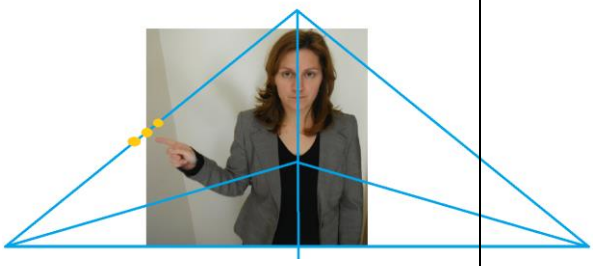
b

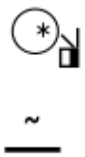
Jew xorta (or are the same) c.

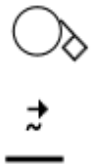
Exercise 7a : SW LSM Pronominal Explanation

First Explain the Key to the Deaf Participants.

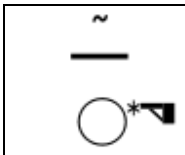
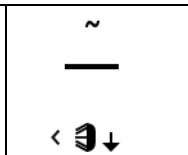
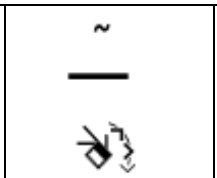
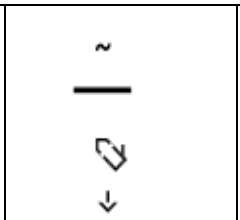
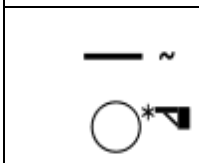
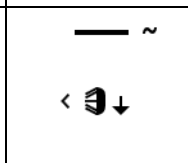
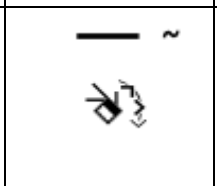
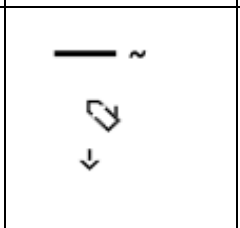
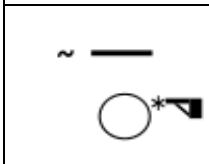
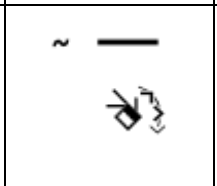
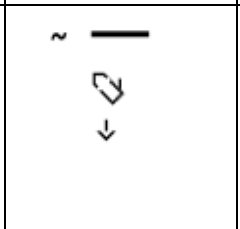
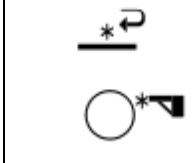
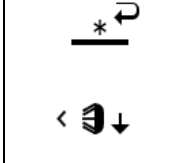
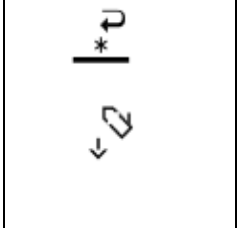
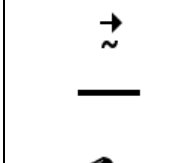
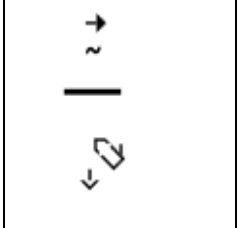
Pronoun	*SW Proposed Key*	*Image*
JIENA (I/ME) 1PER-SG		
INTI (YOU) 2PER-SG		
HUWA/HIJA (HE/HIM/SHE/HER) 3PER-SG	 or  or	
AꟾNA (WE/US) 1PER-PLU		

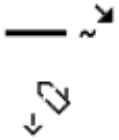
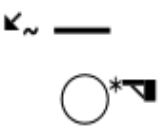
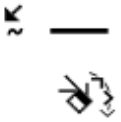
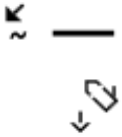
INTOM (YOU) 2PER-PLU		
HUMA (THEY/THEM) 3rd person plural	 Or  or 	

ARA (TO SEE)+	*AF (TO KNOW)*	*KELLEM (TO SPEAK)*	*GĦID (TO SAY)*	*+PRONOMINAL SUFFIX*
				-NI (ME)
				-K (YOU SG)
				-H/HA rt (HIM/HER rt)
				-(H/HA lt (HIM/HER lt
				-NA (US)

				-KOM (YOU PLU)
				-HOM rt (THEM rt)
				-HOM lt (THEM lt)

IFHEM (TO UNDRSTAND)	*AĦTAF (TO GRASP)*	*ISRAQ (TO STEAL)*	*ILQA'(TO WELCOME)*	*+PRONOMINAL PREFIX*
				NI (ME)-

				K (YOU SG)-
				H/HA rt (HIM/HER rt)-
				(H/HA lt (HIM/HER lt-
				NA (US)-
				KOM (YOU PLU)-

				HOM rt (THEM rt)-
				HOM lt (THEM lt)-

Kummenti (Comments) :

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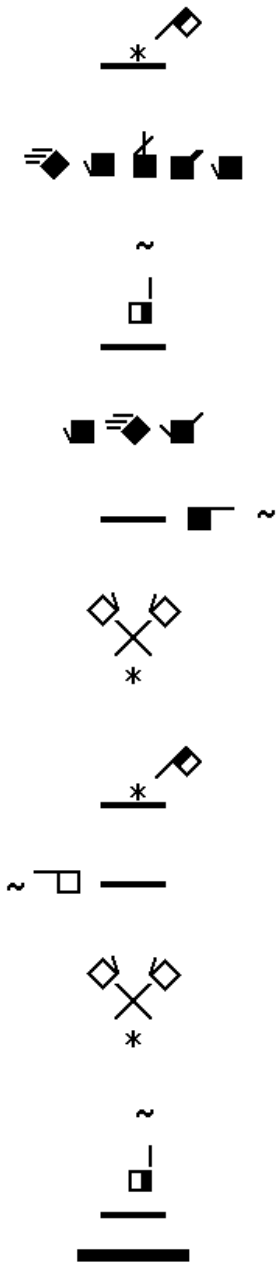
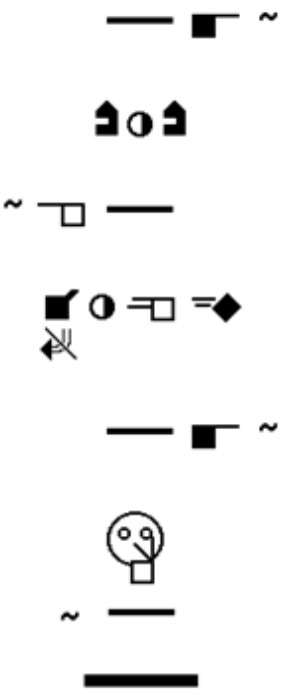
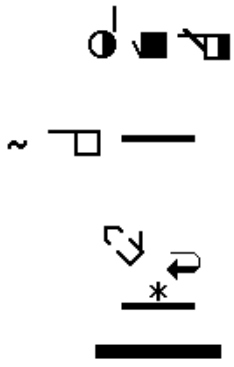
_____

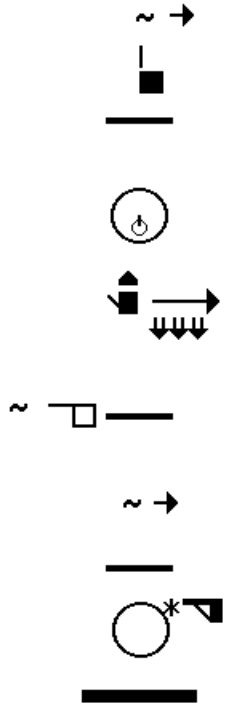
Exercise 7b: SW LSM Pronominals Reading

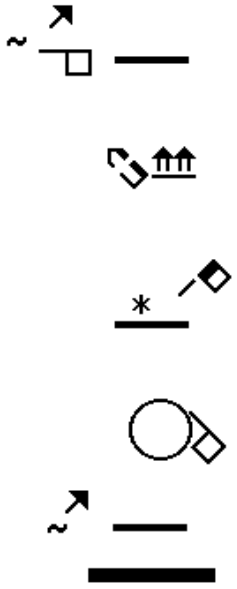
Tista’ taqra dawn is-sentenzi? (Can you read these sentences?)

1. 

2. 

3. 

4. 

5. 

Kummenti (Comments):

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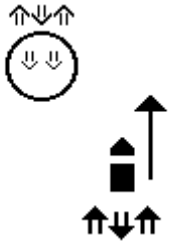
_____

_____

Exercise 8a: Forward or Sideways SW LSM WE classifier verbs

Liema tippreferi? (Which sentence do you prefer?)

1a.  ☐ b.  ☐ c. Xorta (The same) ☐

2a.  ☐ b.  ☐ c. Xorta (The same) ☐

Kummenti (Comments):

_____

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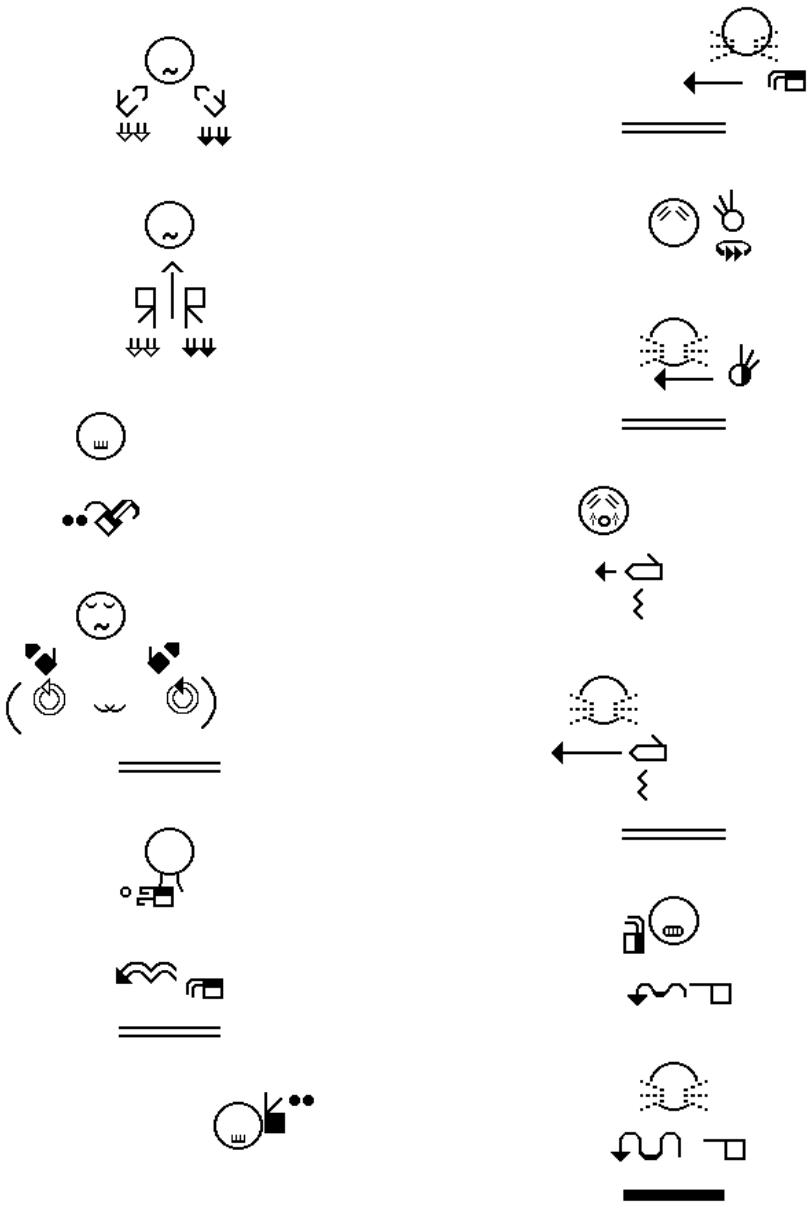
Exercise 8b: WE classifier verbs - Reading

Tista' taqra dan? (Can you read this?)



Kummenti (Comments)

_____

_____

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APPENDIX D: THE PILOT QUESTIONNAIRE (EXERCISE 1)

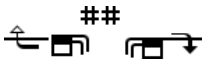
In this appendix one can find the only exercise that was modified before it became part of the reading-questionnaire used in this work. It was decided not to include the whole pilot questionnaire for the sake of unnecessary repetition, since all other exercises of the reading-questionnaire were piloted but not modified in any way. They can be found in Appendix C.

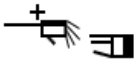
Exercise 1: Glyph-Preference

Liema tippreferi jew xorta? (Which do you prefer, or are they the same?)

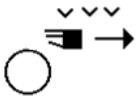
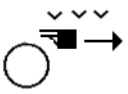
1. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

2.a.  ☐ b.  ☐ c. Xorta (The Same) ☐

3. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

4. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

5. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

6. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

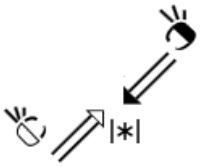
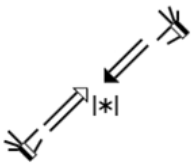
7. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

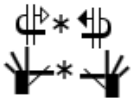
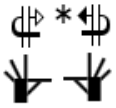
8. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

9. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

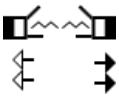
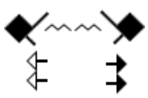
10. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

11. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

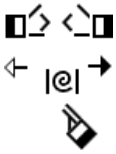
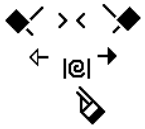
12. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

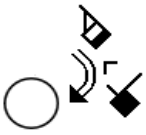
13. a.  ☐ b.  ☐ c.  ☐

d. Xorta (The Same) ☐

14. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

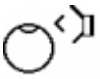
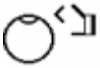
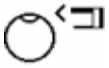
15. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

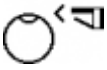
16. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

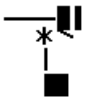
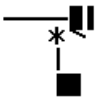
17. a.  ☐ b.  ☐ c. Xorta (The Same) ☐

18. a.  ☐ b.  ☐ c.  ☐

d.  ☐ e.  ☐ f. Xorta (The Same) ☐

19. a.  ☐ b.  ☐ c.  ☐

d.  ☐ e. Xorta (The Same) ☐

20. a.  ☐ b.  ☐ c.  ☐ d.  ☐

e. Xorta (The Same) ☐

APPENDIX E: 81 SIGNPUDDLES ANALYSED

In Table E1 the 81 SignPuddles are analysed. The highlighted in yellow represent those Puddles that have not changed from 2012 to 2014. The blue highlighted represent those that have changed. In the list of the blue highlighted Puddles the number in the square brackets represents the number of entries in 2014. The two Puddles highlighted in grey represent Puddles which have decreased in number from 2012 to 2014. Reason for this has been explained by the editor of the Norwegian Puddle due to 'cleaning' of the Puddle, where double entries are removed or the editor has removed entries for other reasons. It is not known why the Swedish Puddle has decreased in number from 2012-2014.

The number in the round brackets that are found for Puddle 2 (Literature Entries) represents the total number of signs (not entries) per Puddle. There may be a smaller or larger discrepancy between the number of entries and the number of signs. If the number of signs is close to the number of entries it means that the sentences are very short. If the number of signs is much higher than the number of entries it means that the sentences are longer. A large Literature Puddle is calculated on the basis of the number of signs, rather than number of entries.

Table E 1: The Public SignPuddles. 'Code' = country code. 454 (13,754) = number of text entries (number of individual signs). n/a = not available. Square brackets = entries in 2014.

		Puddle 1	**Puddle 2**	**Puddle 3**
Country/Sign Language	**Code**	**Dictionary Entires**	**Literature Entries**	**Encyclopaedia Entries**
Afghanistan	AF	13	n/a	n/a
Argentina	AR	1,726	n/a	n/a
Australia	AU	24	n/a	n/a

Austria	AT	4	n/a	n/a
Bangladesh	BD	0	n/a	n/a
Bolivia	BO	5	n/a	n/a
Brazil	BR	2,948 [3,386]	132 (3,401) [143]	n/a
Bulgaria	BG	0	n/a	n/a
Canada English	CA-en	Directed to U.S Puddle	Directed to U.S Puddle	Directed to U.S Puddle
Canada Quebec*[64]	CA-fr	3,202 [4,378]	170 (1,364) [204]	n/a
Chile	CL	0	n/a	n/a
China	CN	0 [17]	n/a	n/a
Colombia	CO	347 [445]	n/a	n/a
Czech Republic	CZ	2,163 [5,281]	15 (933) [28]	n/a
Denmark	DK	7	0	n/a
Dictionary International	IN	61 [81]	n/a	n/a
Ecuador	EC	0	n/a	n/a
Egypt	EG	109	n/a	n/a
El-Salvador	SV	0	n/a	n/a
Esperanto (SignUno)[65]	EO	2,310 [2,316]	n/a	n/a
Estonia	EE	0	n/a	n/a
Ethiopia	ET	143	0	n/a
Finland	FI	164 [165]	n/a	n/a
Flanders-Belgium	Be-nl	5,091 [5,401]	32 (375) [38]	n/a
France	FR	1,360 [1,377]	10 (10) [11]	n/a
French Switzerland	CH-fr	5,617 [5,741]	43 (113) [45]	n/a
French-Belgium	BE-fr	1,660 [2,050]	0 [2]	n/a
German Switzerland	CH-de	4,668	26 (176)	n/a
Germany	DE	18,501 [22,121]	396 (4,935) [412]	11 (56)
Great Britain	GB	657 [726]	33 (313) [37]	n/a
Greece	GR	25	n/a	n/a
Guatemala	GT	0	n/a	n/a
Haiti	HT	1	n/a	n/a
Honduras	HN	7 [197]	n/a	n/a
Hungary	HU	67	1 (1)	n/a
Iceland	IS	39	n/a	n/a
India	IN	0	n/a	n/a
Ireland	IE	25	n/a	n/a
Israel	IL	3	n/a	n/a
Italian Switzerland	CH-it	3	n/a	n/a

[64]Quebec dictionary and literature SignPuddles are available for the Blind and the Sighted. (add more after you ask about this)

[65] SignUno is not a natural sign language, rather it is Signed Exact Esperanto. Signuno is not used, and is based on the Esperanto community rather than based on the international Deaf community. Gestuno (or International Sign Language) is unrelated to SignUno (http://en.wikipedia.org/wiki/International_auxiliary_language retrieved 29/08/2012)

Italy	IT	17 [167]	n/a	n/a
Japan	JP	186 [187]	2 (1)	n/a
Jordan	JO	24	1 (1)	n/a
Kenya	KE	17	n/a	n/a
Latvia	LV	0	n/a	n/a
Lithuania	LT	0	n/a	n/a
Malawi	MW	14	n/a	n/a
Malaysia	MY	4	n/a	n/a
Malta	MT	748 [769]	557 (5,468) [668]	n/a
Mexico	MX	178	0	n/a
Nepal	NP	4 [5]	n/a	n/a
Netherlands	NL	64 [67]	n/a	n/a
New Zealand	NZ	37	n/a	n/a
Nicaragua	NI	897 [1,532]	454 (10,841)	n/a
Nigeria	NG	0	n/a	n/a
Northern Ireland	GB-ie	55 [56]	n/a	n/a
Norway	NO	8,285 [7723]	343 (2,283) [342]	n/a
Pakistan	PK	0	n/a	n/a
Paraguay	PY	1,066 [2,466]	n/a	n/a
Peru	PE	28	n/a	n/a
Philippines	PH	904	n/a	n/a
Poland	PL	2,126	4 (20)	n/a
Portugal	PT	210 [232]	4 (35)	n/a
Romania	RO	37	0	n/a
Russia	RU	91 [98]	0	n/a
Saudi-Arabia	SA	278 [356]	0 [3]	n/a
Slovakia	SK	37 [42]	n/a	n/a
Slovenia	SI	16 [2,346]	n/a [10]	n/a
South Africa	ZA	52 [53]	n/a	n/a
South Korea	KR	21 [22]	n/a	n/a
Spain	ES	7,813 [7,848]	454 (13,754) [455]	n/a
Spain-Catalonia	ES-ct	3,290 [3,292]	17 (23)[66]	
Sweden	SE	19 [16]	n/a	n/a
Taiwan	TW	205	n/a	n/a
Thailand	TH	57	n/a	n/a
Tunisia	TN	1,447 [2,923]	34 (1,295) [115]	n/a
Turkey	TR	3 [4]	n/a	n/a
Ukraine	UA	0	n/a	n/a
United States	US	9,326 [9,891]	624 (10,775) [682]	18 (268)[67] [818]
Uruguay	UV	61 [63]	0	n/a
Venezuela	VZ	8 [131]	n/a	n/a

[66]This is not a Literature Puddle since all entries consist of just two or three signs and not longer stretches of text.

[67]US Puddles: there are 3 more large Puddles for ASL. One of these is the ASL Bible. This Puddle is huge and consists of

Table E 2: The Private SignPuddles in 2012

Private Puddle No. 1	DOOR	US	16 (386)	n/a
Private Puddle No. 2	LLCN and SignTyp	US	5,517	Dictionary
Private Puddle No. 3	ASL Bible	US	13,126 (120,743)	Literature [Dictionary]
Private Puddle No. 4	Time and Date Database	n/a	0	n/a
Private Puddle No. 5	Malta LSM Private Puddle	Malta	234 (1,974)	Literature
Private Puddle No. 6	DAC Private Puddle	US	108 (304)	n/a
Private Puddle No. 7	n/a	n/a	n/a	n/a
Private Puddle No. 8	n/a	n/a	n/a	n/a
Private Puddle No. 9	n/a	n/a	n/a	n/a

The Private Puddles were reshuffled in 2014 (Table D4) due to the enlargement of the Bible Puddle.

Table E 3: The Private SignPuddles in 2014

Private Puddle No. 1	DOOR (Deaf Harbor]	US	16 (386)	n/a
Private Puddle No. 2	LLCN and SignTyp	US	5,523	Dictionary
Private Puddle No. 3	ASL Bible Dictionary	US	7,970	[Dictionary]
Private Puddle No. 4	ASL Bible Books NLT	US	7,738 (143,602	Literature
Private Puddle No. 5	ASL Bible Books Shores	US	2212 (35,639)	Literature
Private Puddle No. 6	Translate Wiki ASL	US	207 (349)	
Private Puddle No. 7	DAC Private Puddle	US	108 (304)	n/a
Private Puddle No. 8	Malta LSM Private Puddle	Malta	234 (1,974)	Literature
Private Puddle No. 9	Anthropology Book Project	Various	1 (14)	Literature

Table E 4: Dictionary SignPuddles: Active to highly active dictionaries

Egypt	EG	109
Ethiopia	ET	143
Finland	FI	164
Mexico	MX	178
Japan	JP	186
Taiwan	TW	205
Portugal	PT	210
Saudi-Arabia	SA	278
Colombia	CO	347
Great Britain	GB	657
Malta	MT	748
Nicaragua	NI	897
Philippines	PH	904
Paraguay	PY	1,066
France	FR	1,360
Tunisia	TN	1,447
French-Belgium	BE-fr	1,660
Argentina	AR	1,726
Poland	PL	2,126
Czech Republic	CZ	2,163
Esperanto (SignUno)	EO	2,310
Brazil	BR	2,948
Canada Quebec	CA-fr	3,202
Spain-Catalonia	ES-ct	3,290
German Switzerland	CH-de	4,668
Flanders-Belgium	Be-nl	5,091
French Switzerland	CH-fr	5,617
Spain	ES	7,813
Norway	NO	8,285
United States	US	9,326
Germany	DE	18,501

Table E 5: Cross-Comparison of SignPuddles use of glyphs (Glyph-Groups 1-10)

Group	1	2	3	4	5	6	7	8	9	10
										
ISWA 2010	**14**	**16**	**38**	**8**	**58**	**30**	**22**	**19**	**40**	**16**
ASL Bible	5	9	10	5	40	11	6	7	24	8
Spain /ES	4	7	10	4	23	10	3	5	21	5
Nicaragua/ NI	4	7	7	4	22	11	1	4	22	9
US	8	9	12	6	40	11	2	8	24	9

Malta /MT	*4*	*6*	*6*	*3*	*23*	*6*	*0*	*2*	*18*	*2*
Germany/ DE	6	8	9	4	28	8	1	2	23	5
Brazil / BR	3	8	8	3	21	9	3	3	17	6
Norway/ NO	4	6	3	3	22	10	1	4	20	4
Tunisia / TN	6	7	6	6	22	3	0	2	18	3
Czech / CZ	4	4	3	1	23	2	0	2	13	3

Table E 6: Cross-Comparison of SignPuddles use of glyphs (Glyph-Groups 11-20)

Group	11	12	13	14	15	16	17	18	19	20
										
ISWA 2010	**17**	**20**	**43**	**16**	**35**	**30**	**17**	**30**	**14**	**20**
ASL Bible	15	13	36	8	30	24	3	25	14	15
Spain /ES	10	10	28	4	23	18	2	13	13	14
Nicaragua /NI	15	9	25	7	18	15	1	12	8	9
US	15	13	32	9	26	26	6	20	14	14
Malta /MT	*15*	*12*	*20*	*10*	*21*	*18*	*0*	*7*	*11*	*10*
Germany/ DE	11	10	37	4	16	18	2	14	10	11
Brazil / BR	13	9	22	6	12	13	5	7	9	8
Norway / NO	10	7	16	2	18	13	0	8	9	8
Tunisia / TN	14	11	17	5	15	5	12	10	11	11
Czech / CZ	10	9	11	1	14	7	0	8	7	5

Table E 7: Cross-Comparison of SignPuddles use of glyphs (Glyph-Groups 21-30)

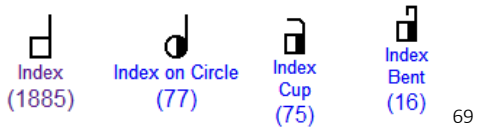
Group	21	22	23	24	25	26	27	28	29	30
									Detail Loc	Punct.
ISWA 2010	**8**	**11**	**32**	**17**	**30**	**20**	**9**	**9**	**8**	**5**
ASL Bible	7	6	20	12	28	16	8	8	n/a	n/a
Spain	7	6	16	8	18	10	4	9	n/a	n/a

Nicaragua/NI	8	5	14	11	19	10	6	8	n/a	n/a
US	7	10	21	12	32	11	8	9	n/a	n/a
Malta /MT	*6*	*5*	*18*	*5*	*17*	*7*	*6*	*5*	*n/a*	*2*
Germany / DE	6	4	19	9	23	8	8	8	n/a	n/a
Brazil / BR	7	5	14	6	13	6	4	6	n/a	n/a
Norway/ NO	6	7	11	12	21	9	7	7	n/a	n/a
Tunisia/ TN	7	6	15	4	12	5	4	7	n/a	n/a
Czech/ CZ	6	7	18	6	14	6	3	3	n/a	n/a

APPENDIX F: LSM GLYPH-SET FROM THE LMAP[68]

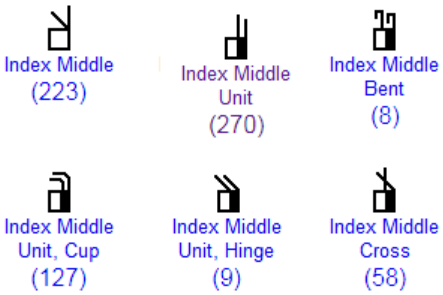
In this appendix the complete list of glyphs found in the Literature Malta Archive Puddle (LMAP) can be found.

Group 1: Index Finger glyphs used in the LMAP

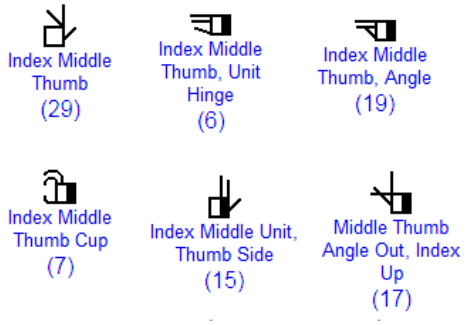


[69]

Group 2: Index and Middle Finger glyphs used in the LMAP



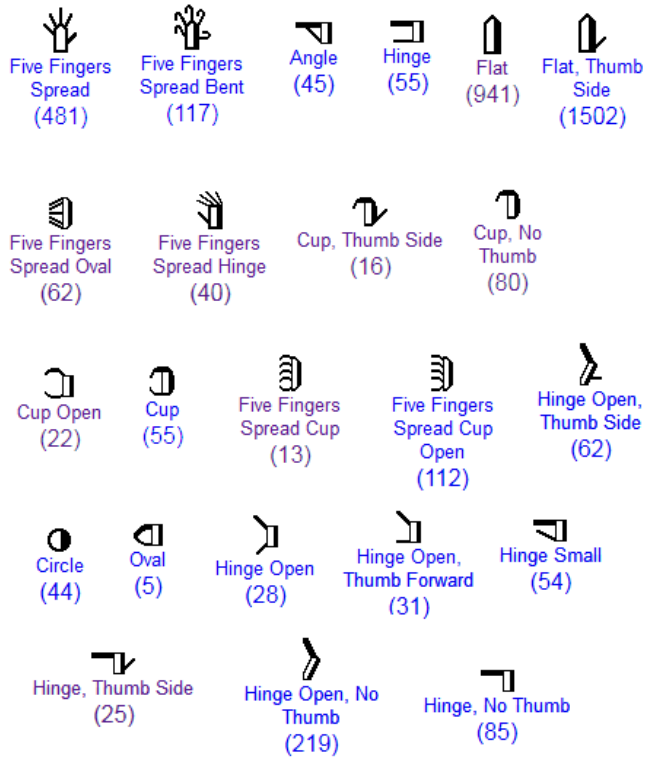
Group 3: Index, Middle, Thumb glyphs used in the LMAP



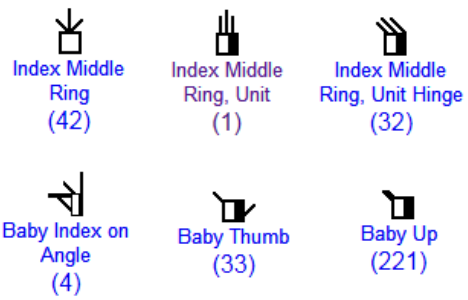
[69] The name underneath the glyph is the official name of the ISWA glyph. The number in brackets indicates the number of times the glyph is used in the given Puddle.

Group 4 Four fingers glyphs used in the LMAP

Group 5 Five Fingers glyphs used in the LMAP



Group 6: Baby Finger used for LSM

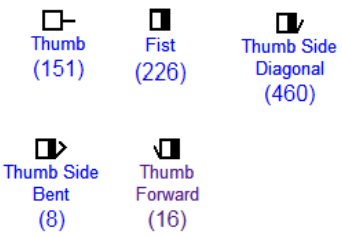


Group 8: Middle Finger glyphs used in the LMAP

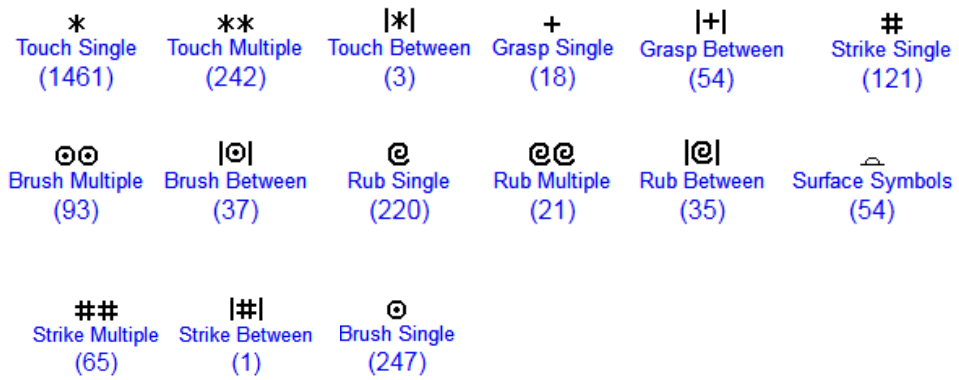
Group 7: No glyphs were used.

Group 9: Index Thumb glyphs used in the LMAP

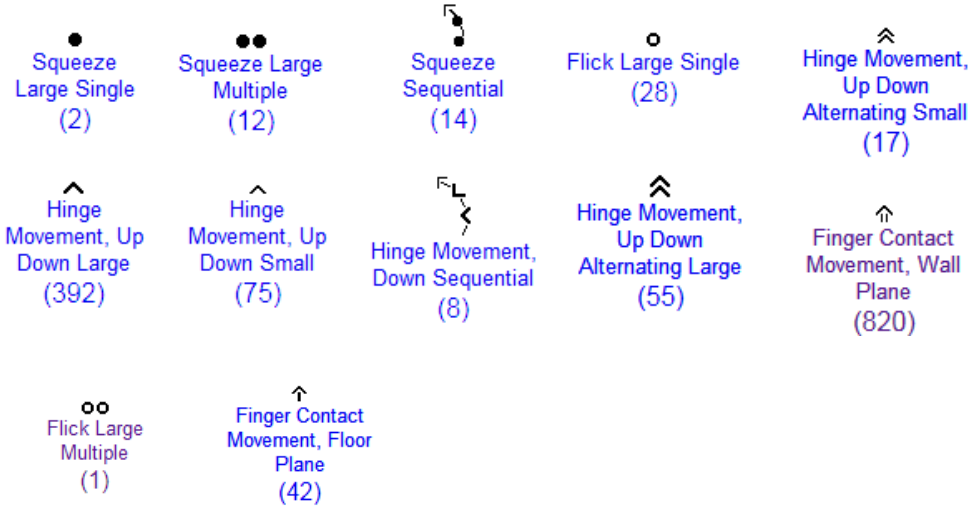
Group 10 Thumb glyphs used in the LMAP



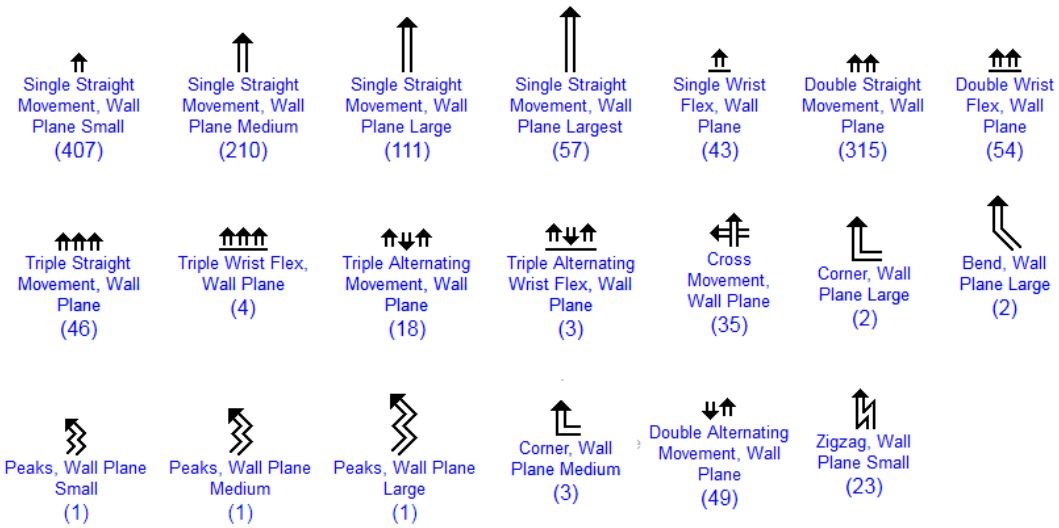
Group 11: Contact glyphs used in the LMAP



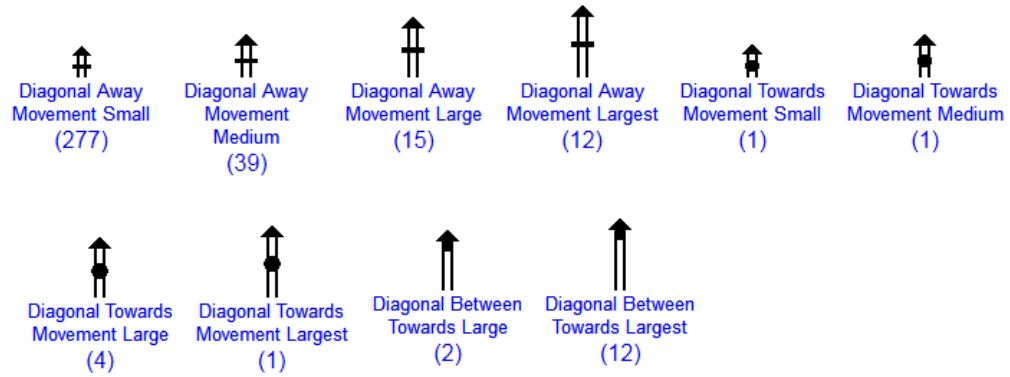
Group 12 Finger Movement glyphs used in the LMAP



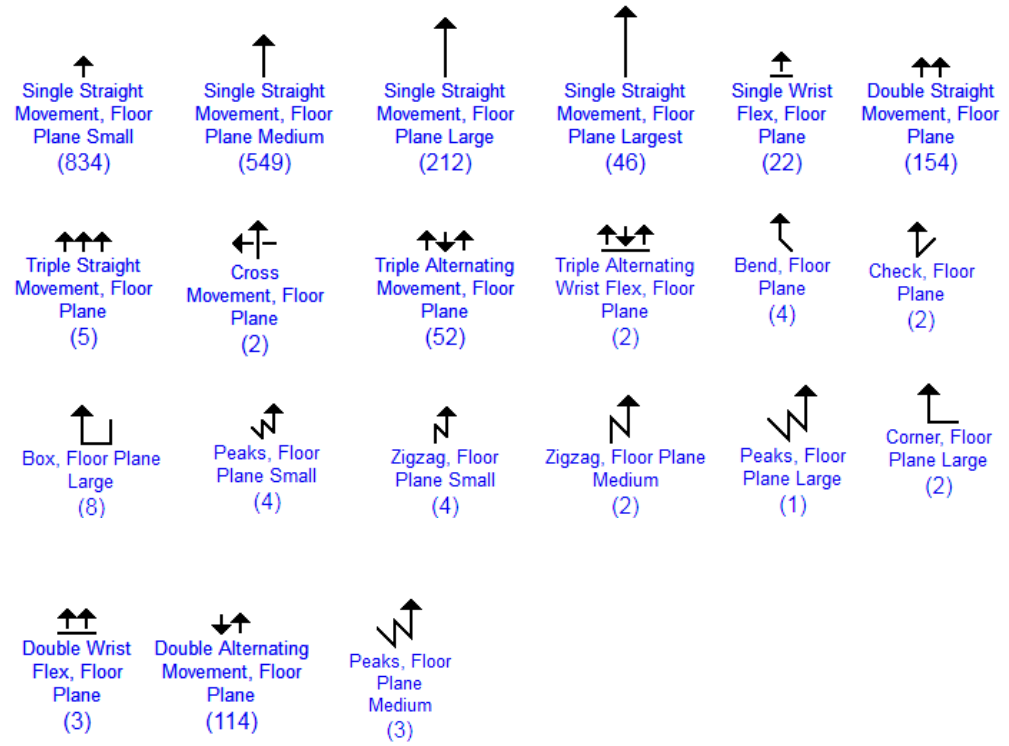
Group 13 Straight Wall Plane glyphs used in the LMAP



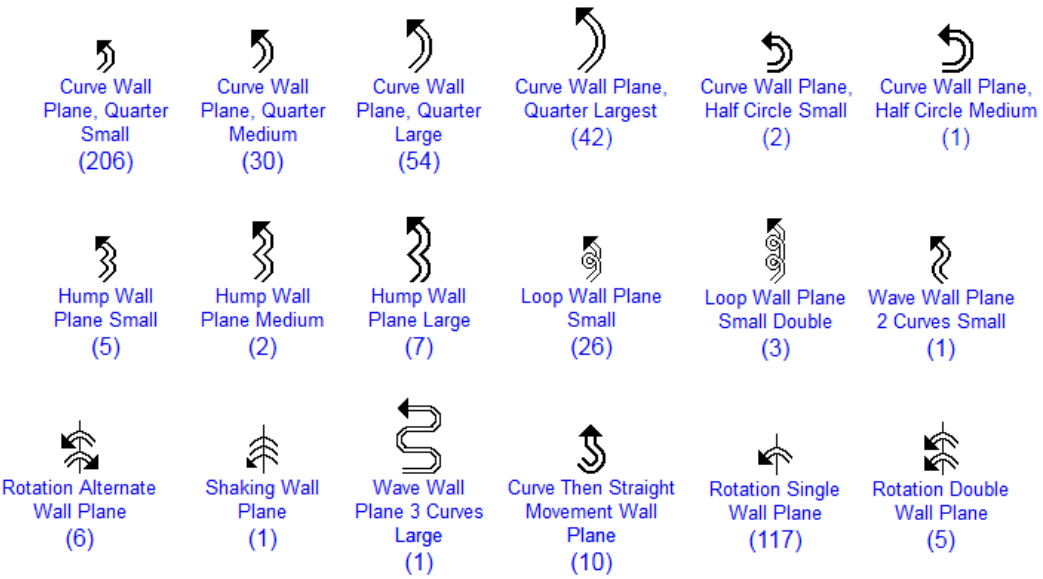
Group 14 Straight Diagonal Plane glyphs used in the LMAP



Group 15: Straight Floor Plane glyphs used in the LMAP

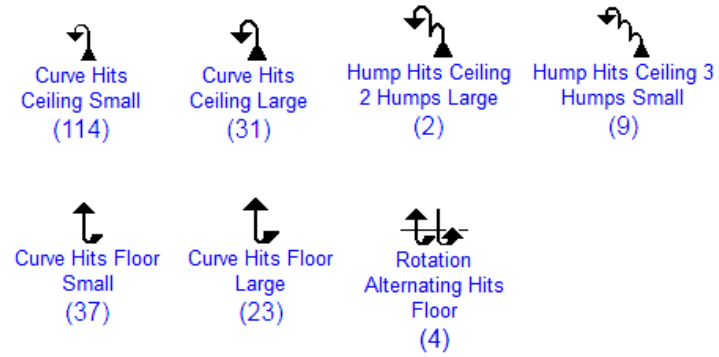


Group 16: Curves Floor Plane glyphs used in the LMAP

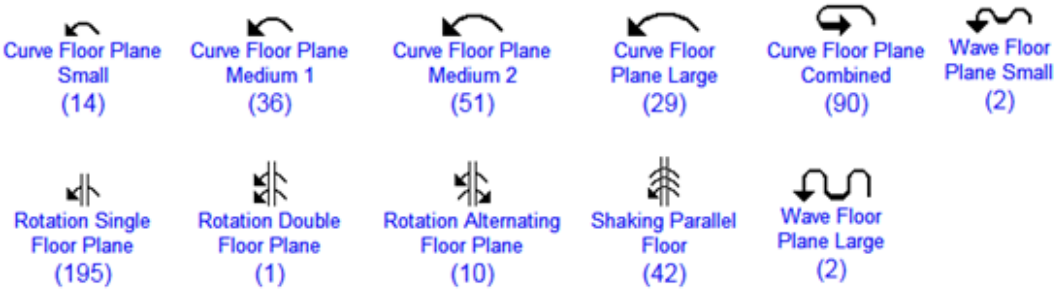


Group 17: No glyphs were used.

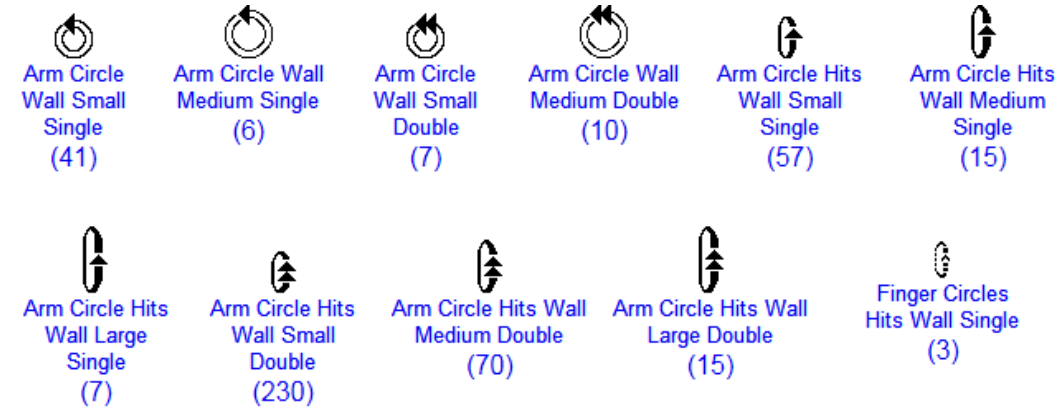
Group 18 Curves Hit Floor Plane glyphs used in the LMAP



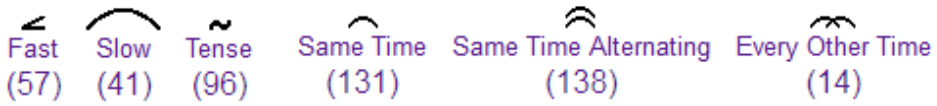
Group 19: Curves Floor Plane glyphs used in the LMAP



Group 20: Circle Movement glyphs used in the LMAP

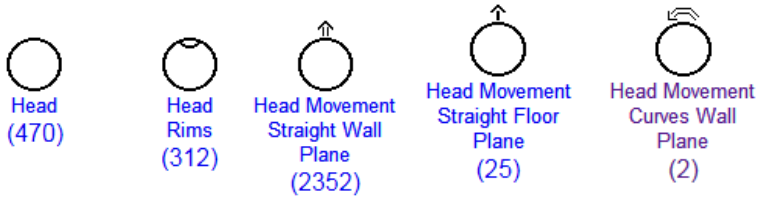


Group 21: Dynamics glyphs used in the LMAP

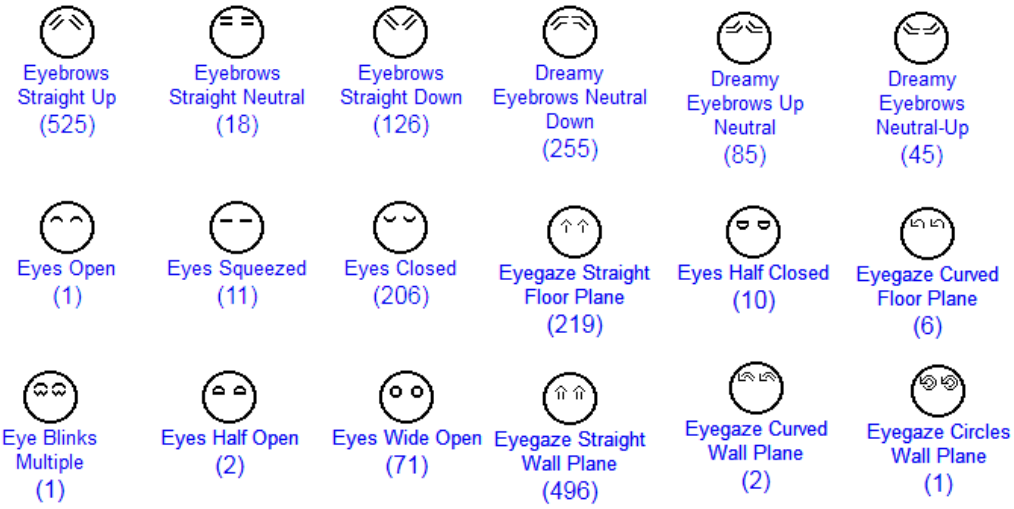


Group 22 Head glyphs used in the LMAP

From the LSM Literature Puddle it results that LSM text writing uses 52 head/face glyphs (Groups 22-26).

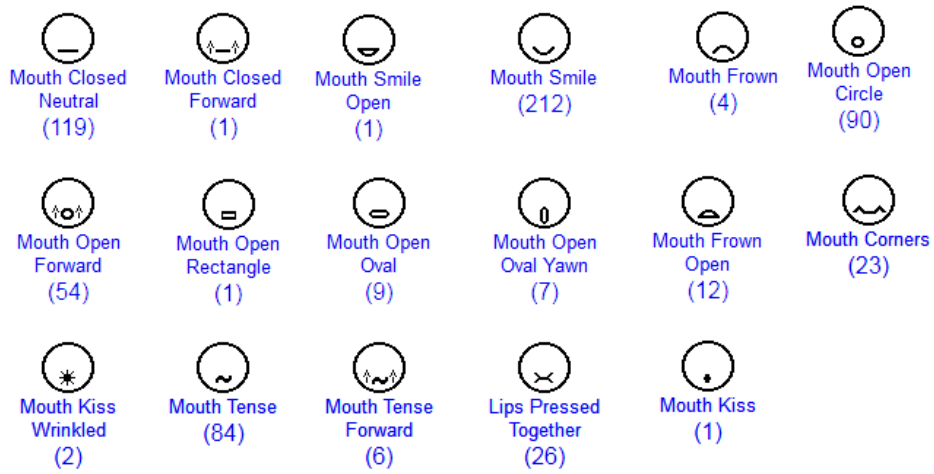


Group 23: Brows and Eyes glyphs used in the LMAP

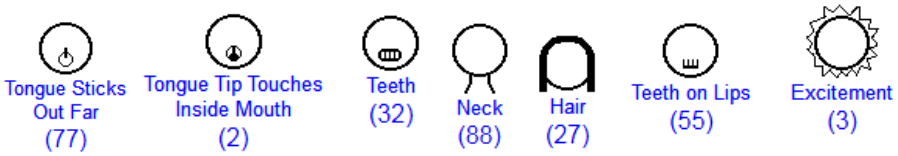


Group 24: Cheeks, Ears, Nose, Breath glyphs used in the LMAP

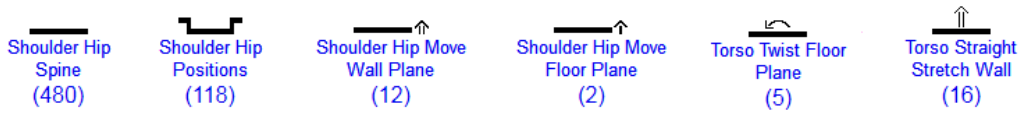
Group 25 Mouth glyphs used in the LMAP



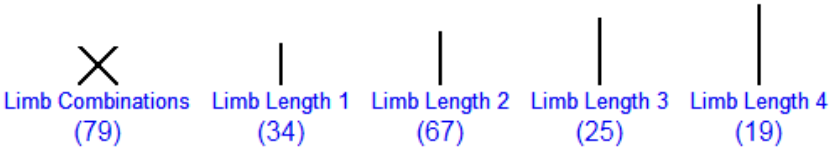
Group 26: Tongue, Neck, Hair glyphs used in the LMAP



Group 27: Trunk glyphs used in the LMAP



Group 28: Limb glyphs used in the LMAP



Group 29: No glyphs were used.

Group 30: Punctuation glyphs used in the LMAP

. Pause Stop

APPENDIX G: MANUAL FOR THE WRITING OF LSM

In this appendix an instruction manual for the writing of LSM is created from the basis of the findings in the work. More LSM SW examples are needed for the working manual. However, this manual provides a frame and base for the formation of a full-fledged LSM SW manual.

G1: INTRODUCTION

The writing of LSM uses SignWriting (SW), a featural and transparent writing system that was created by Valerie Sutton. SW symbols are referred to as the ISWA 2010 (the International SignWriting Alphabet 2010). This manual does not teach SW. Rather it teaches the orthography of LSM that has evolved from SW.

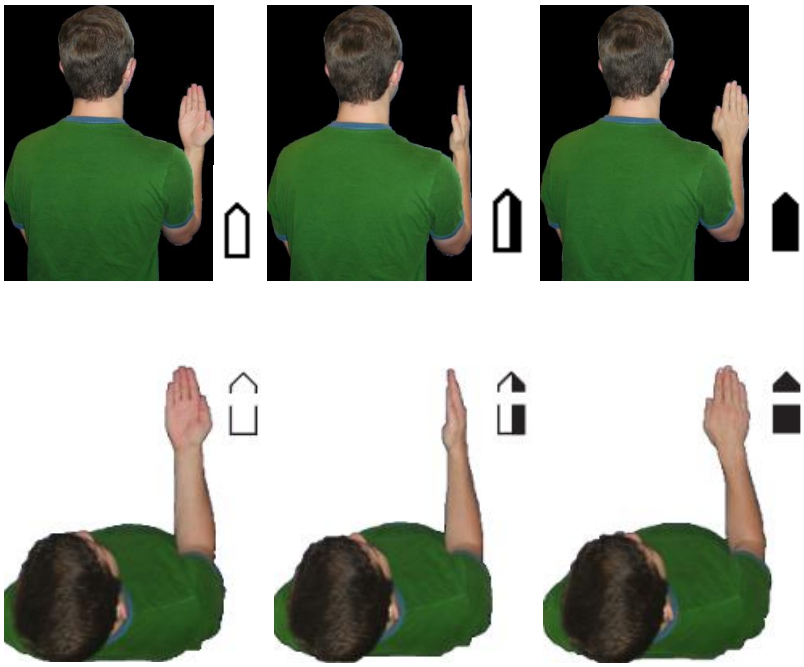
Prior to this manual no instruction was available for the writing of LSM. Writing LSM would consist of making choices from a large symbol-set of the ISWA 2010. Here a smaller symbol-set has been derived from the ISWA 2010. For the first time ever a grapheme-set for LSM has been established.

G2 GENERAL SW PRINCIPLES

G2.1 The Expressive Viewpoint and orientations

When writing LSM the expressive viewpoint of SW is used. This means that wen writing an LSM sign all the glyphs are orientated and placed in relation with one another, as though the signer is signing. The expressive viewpoint can be seen in Figure G1 below.

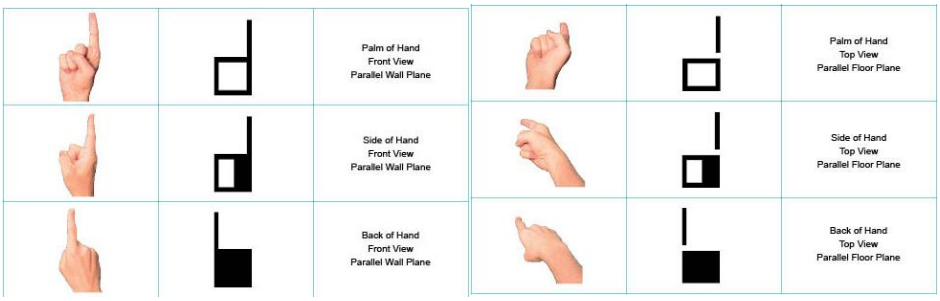
Figure G 1: Expressive Viewpoint and Handshape glyph orientation



Furthermore it can be seen that when the hand is on a vertical plane it is represented as:  in contrast to  that represents the hand lying on a horizontal plane (Figure G1).

All handshape glyphs follow this pattern (see Figure G2) and the shading of the hands indicate the orientation of the palm. The seperated-finger glyphs represent the hands that are lying on the horizontal plane.

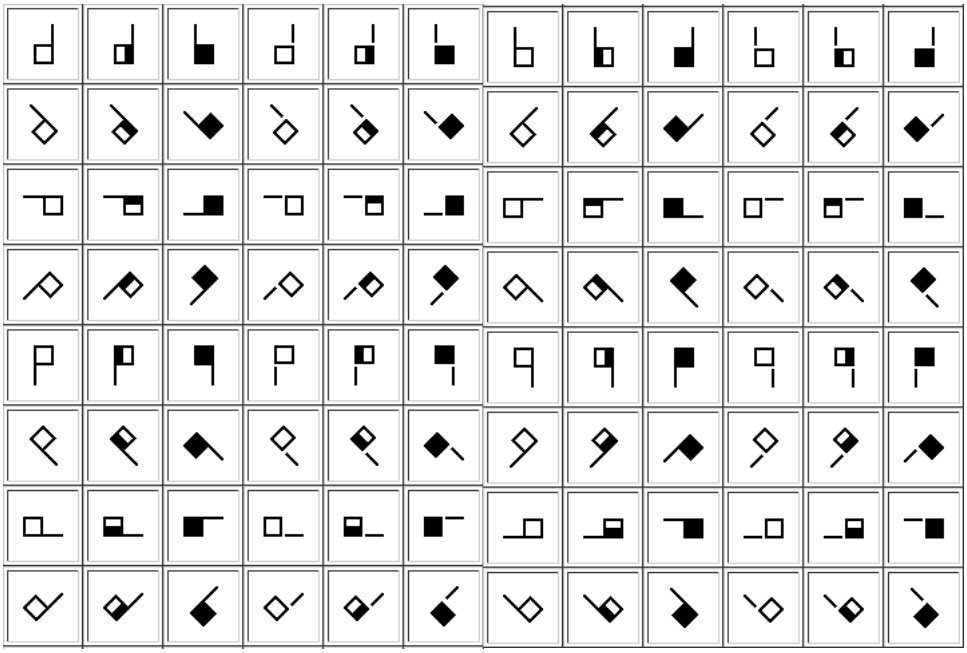
Figure G 2: Pattern of Handshape glyph shading marking orientation



G2.2 Rotations of Graphemes

It is important to note that all handshape and movement graphemes can rotate according to the need. To illustrate, the LSM index-finger grapheme may rotate to a number of different positions as can be seen in Figure G3.

Figure G 3: Rotations of the LSM index-finger handshape grapheme



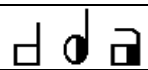
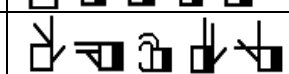
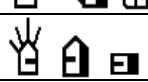
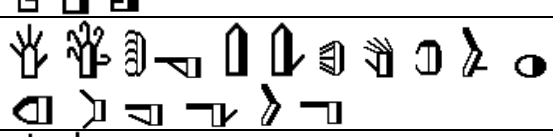
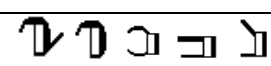
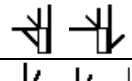
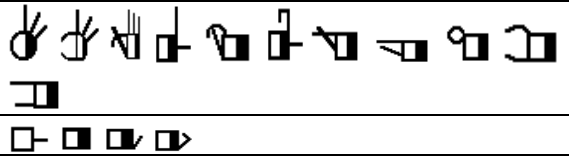
G3 THE LSM GRAPHEME-SET (ALPHABET)

The following is a list of all the graphemes that are required for the writing of LSM. Handshape and movement grapheme-sets are conclusive and have been studied in depth. Other parameters, i.e. head/face graphemes, contact graphemes, dynamics graphemes and body graphemes are all taken from the LMAP (Appendix F). The glyphs in the LMAP that have been used less than 10 times are not included in the grapheme-sets unless there is a reason for their inclusion, in which case it will be explained.

G4 LSM HANDSHAPE GRAPHEMES

One component of an LSM sign is the handshape. There are 57 handshape graphemes in LSM. There are an additional 13 glyphs (see Figure G4). These glyphs are not necessarily graphemes, i.e. they do not necessarily represent a phoneme distinction. However, they may be required to use in LSM spellings in order to represent iconicity.

Figure G 4: 56 Handshape graphemes and 13 grapheme-variants of LSM (taken from Figure 8.6)

SW Group	Handshape Graphemes of LSM	Grapheme-Variants
1		
2		
3		
4		
5		
6		
7	none	
8		
9		
10		

A list of examples is provided here:

SW group 1: WIEĦED (ONE), ‘D’ (D), GAMBLI (SHRIMPS).

SW group 2: TNEJN (TWO), U (AND), CL-OĠĠETT ANIMAT, ‘N’, ‘R’,

SW group 3: TMIENJA (EIGHT), TABIB (DOCTOR), PLAGG (PLUG), BIEREK (BLESS), ‘K’ (K)

SW group 4: ERBGHA (FOUR), ‘E’ (E), ‘S’ (S).

SW group 5: ĦAMSA (FIVE), TIGRA (TIGER), POST (PLACE), KIEL (EAT), IRAQ (IRAQ), FEJN (WHERE), DAWL (LIGHT), TKELLEM (SPEAK), 'C' (C), ANĠLU (ANGEL), 'O' (O), DAR (HOUSE).

SW group 6: 'W' (W), SKAWTS (SCOUTS), M (M), ANNIMAL, 'Y' (Y), ĦAŻIN (BAD).

SW group 8: ŻWIEĠ (MARRIAGE), ĠESU' (JESUS)

SW group 9: EŻATTI (EXACT), WC, F(F), L (L), XABLA (SWORD), G (G)

G5 LSM MOVEMENT GRAPHEMES

Another component of the LSM sign is movement of the hand/s. The full list of movement graphemes are listed in Figure G5. There are also a list of movement grapheme-variants that may be required to represent iconicity in LSM. Each grapheme may be modified into 1) a longer arrow, 2) a shorter arrow, 3) a reduplicated arrow. These modifications result in a list of grapheme-variants. Also movement graphemes may combine with one another to represent iconicity (such as the movements of Whole Entity Classifiers).

Figure G 5: LSM Movement Graphemes

Movement Arrow Grapheme-Set for the writing of LSM		
HORIZONTAL PLANE	VERTICAL PLANE	AXIAL MOVEMENT
 FORWARD	 UP/DOWN	 ARM ROTATE
 ZIGZAG	 ZIG ZAG UP	 WRIST FLEX
 CURVE	 CURVE UP	
 WAVE	 WAVE UP	
	 UP-DOWN	
	 BOUNCE	
	 SPIRAL-UP	
	 UP AND OVER	
	 CIRCLE	
	 UP OVER CIRLE	
	 DOWN-UNDER	

Sometimes the movement of the hands requires further marking. For example, when the movement is slow as in BALENA (WHALE) or fast as in SPEED-CAMERA (SPEED-CAMERA) (see Figure G 6).

Additionally the 'Alternating' glyph and 'Move-Together' glyph are used when two handshape glyphs are part of an LSM sign. When both hands move they require

marking in written form to distinguish both hands moving together from both hands alternating.

Figure G 6: LSM Dynamic Graphemes

LSM Dynamics Graphemes	
	Fast
	Slow
	Tense
	Alternating
	Move-Together

G6 LSM CONTACT AND FINGER MOVEMENT

Related to movement graphemes are contact and finger movement LSM graphemes. These can be seen in Figure G7 and are based on the findings of the LSM texts in the LMAP (Appendix F). On the basis of the rules suggested for movement graphemes in LSM each 'base' grapheme listed here may be modified in two ways 1) reduplication, e.g.  3) in-between marker to indicate that the contact occurs in-between, e.g.  , e.g. BEJN (BETWEEN) . In the LSM texts the in-between modifier of the grapheme has been used to mark the contact between the fingers with one another and disambiguate this from the contact in neutral space (chest-area).

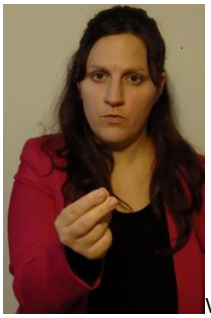
Thus the LSM sign FLUS (MONEY) is spelt as   where the in-between marks that the fingers ‘rub’ with one another. If this in-between marker was not used the following spelling  may be read like this 

Figure G 7: Contact Glyphs for the writing of LSM

LSM Contact and Finger Movement Graphemes	
∗	Touch
+	Grasp
#	Strike
⌀	Rub
⊙	Brush

⌓	On-top-of marker
•	Squeeze
o	Flick
^	Hinge
^^	Hinge Alternating

G7 LSM HEAD/FACE GRAPHEMES

In LSM, like other sign languages, the head is an important component of the sign, since it is frequently used as a location for the handshape/s. Thus the head grapheme is considered an important part of LSM writing.

The head grapheme also contains a number of facial graphemes that are also significant in LSM. The list of head/face graphemes are listed in Figure G8 below.

Figure G 8: Head/Face Graphemes for the writing of LSM

	HEAD-GLYPH
	HAPPINESS
	SADNESS
	ANGER
	CONCERN / WORRY
	FURIOUS /EVIL
	Air-blow out
	Spoken ‘U’

	Spoken ‘O’
	Spoken M’
	Spoken ‘L’
	Spoken ‘F’
	Tense glyph
	Neutral Mouth
	Mouth Corners
	Neck
	Hair
	Teeth
	Ear/ears
	Nose-grapheme

The smile glyph is used in greeting signs such as ⱵELLOW (HELLO) and SAⱵⱵA (BYE).

The following facial expressions taken from Figure G5 are used in direct discourse and role-play:

	HAPPINESS
	SADNESS
	ANGER
	CONCERN / WORRY
	FURIOUS /EVIL

The air-out glyph  is used as an intensifier. It is often found with WE classifier verbs, for example:  CL-OĠĠETT ANIMAT JIMXI ‘L QUDDIEM MGⱵAĠĠEL

(CL-ANIMATE OBJECT MOVE FORWARD FAST) and LSM signs of intense emotion such as  TELGĦALU /(LOSE TEMPER).

The spoken mouth pattern glyphs are often part of LSM signs:

	Spoken ‘U’
	Spoken ‘O’
	Spoken M’
	Spoken ‘L’
	Spoken ‘F’

 BOGĦOD (FAR AWAY)

 HEMM (THERE)

 KELB (DOG)

 FENEK (RABBIT)

The locations of parts of the head-glyph are also used in LSM writing.

 XAHAR (MONTH)

 SENA (YEAR)

 QAL (SAY)

 QASSIS (PRIEST)

 DEAF (DEAF)

 OĦT (SISTER)

G8 LSM BODY GRAPHEMES (TRUNK AND LIMBS)

From the work carried out, the following LSM graphemes have been identified. The SHRUG (see Figure G9) is used in spellings related to extreme fear, cold, submissiveness etc. for instance MA JISTĦOQLUX (UNWORTHY), BIŻA (FEAR).

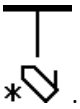
Figure G 9: LSM Body Graphemes

 SHRUG

 SHOULDER

 CROSS-ARMS

 ARM

The stomach glyph is required for the spellings of LSM related to the stomach area,such as the LSM sign ĠUF (WOMB)  .

G9 LSM PUNCTUATION GLYPHS

The following punctuation glyphs are used for the writing of LSM (Figure G10).

Figure G 10: LSM Punctuation Graphemes

 STOP

 PAUSE

 QUESTION

 EXCLAMATION

G10 FORMING AN SW LSM SIGN

An LSM sign is produced not by placing the graphemes in a linear position, like English d-o-g. Rather the graphemes are positioned in relation to one another in a way that parallels the LSM sign.

LSM signs are written with the handshape always positioned at the initial location at the onset of the sign. The initial location can either be anchored to the body or at a point in the signing space. Arrow glyphs then show the path direction of the handshape glyphs. If necessary finger movement glyphs show the change in handshape glyph that occurs during the production of the sign.

G11 FORMING AN SW LSM SENTENCE

An LSM sentence is produced by placing SW signs underneath each other in a vertical column. LSM SW signs may be positioning to the left, right and centre of the column in order to express spatial comparisons, body-shifts and role-play.

G12 WRITING LSM AGREEMENT VERBS

LSM agreement verbs are written with an SW 'key' that establishes the pronominal points in written form. The key is produced by using the shoulder grapheme in relative position to the tense glyph that marks the pronominal point. Movement

glyphs are added to the verbs to show the path direction towards or away from the pronominal points and thus marking subjects and objects accordingly.

G13 WRITING LSM WHOLE ENTITY (WE) CLASSIFIER VERBS

When two LSM Whole Entity Classifiers are involved in a stretch of signing, the head-glyph need not be included in the written form (unless it is required for the intensifier-glyph). However when one classifier handshape is involved the head glyph acts as a bearing and the direction of the movement glyphs in relation to head-glyph marks different meanings of 'forward' vs. 'sideways'.

G14 WRITING LSM HANDLE CLASSIFIER VERBS

LSM handle classifier verbs are written with the head glyph included, with any specified facial glyphs. The handshape glyphs mark the different grip of the hands and the movement parallels the movement involved in the signing that mimics real-life movement.

APPENDIX H: IMPLEMENTING THE RECOMMENDATIONS

This appendix is intended to show the reader how the LSM texts may be modified following this work. Excerpts from the LSM texts in the LMAP are shown in their original written form and then are modified according to the recommendations following this work. Additionally step by step changes of the original LSM texts are described.

H1 REWRITING LSM SENTENCES LUQA15V22 AND LUQA3V11

Figure H1 shows the original writing of Luqa15v22 found in the LMAP. Figure H2 shows the modified writing of Luqa15v22. Figure H3 shows the original writing of Luqa3v11 and Figure H4 the modified writing of Luqa3v11.

Figure H 1: Original LSM sentence of Luqa15v22

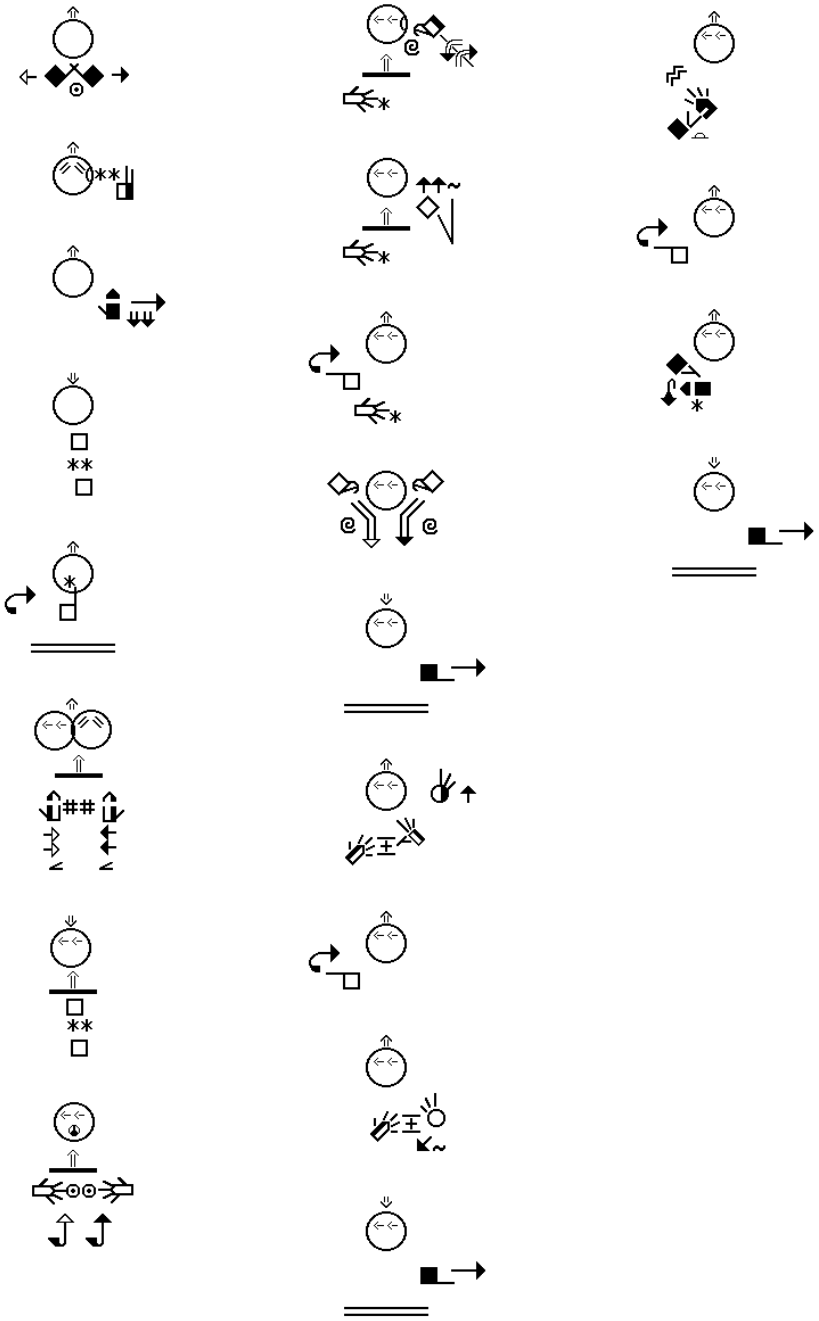


Figure H 2: Modified LSM sentence following the work (Luqa15v22)

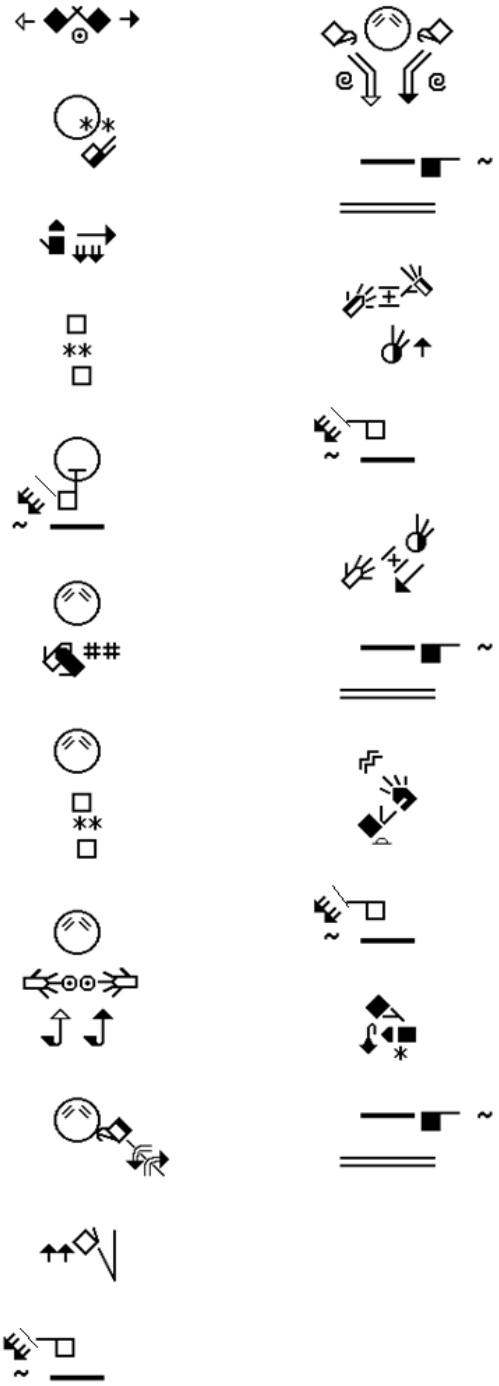


Figure H 3: Original LSM sentence from Luqa3v11 of the LMAP

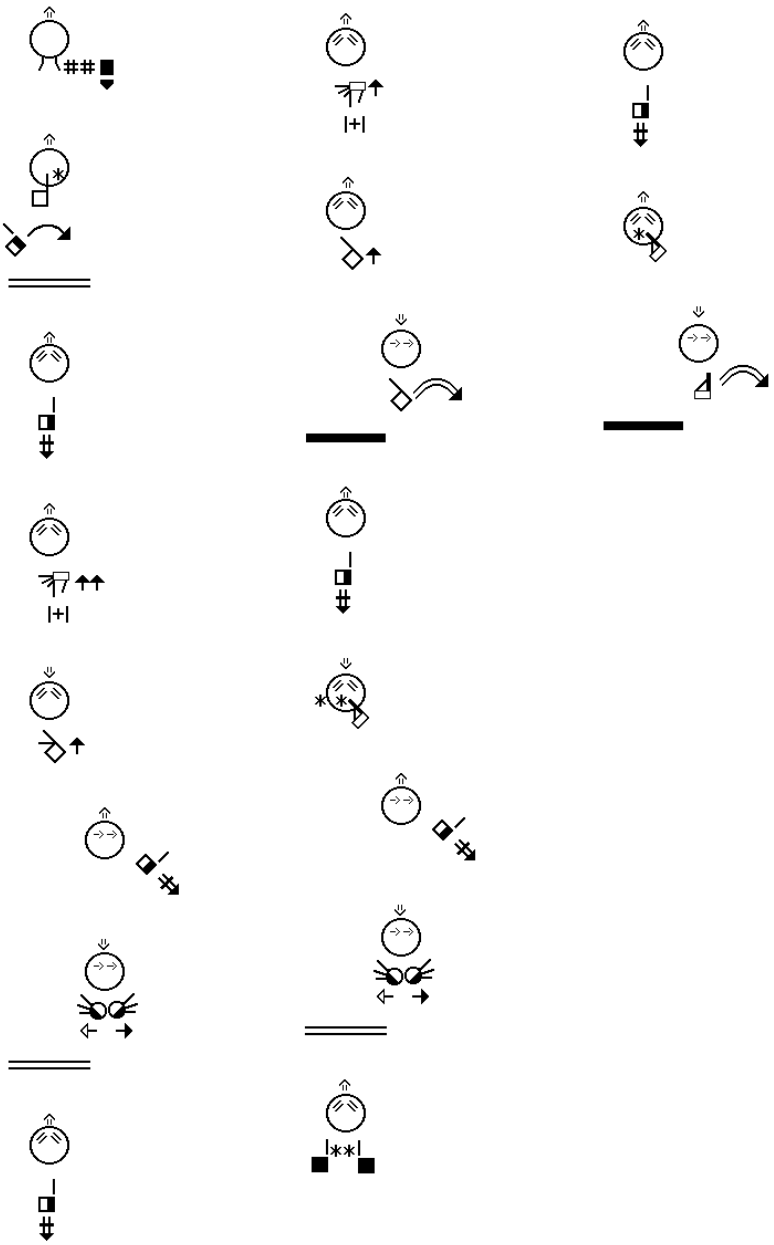
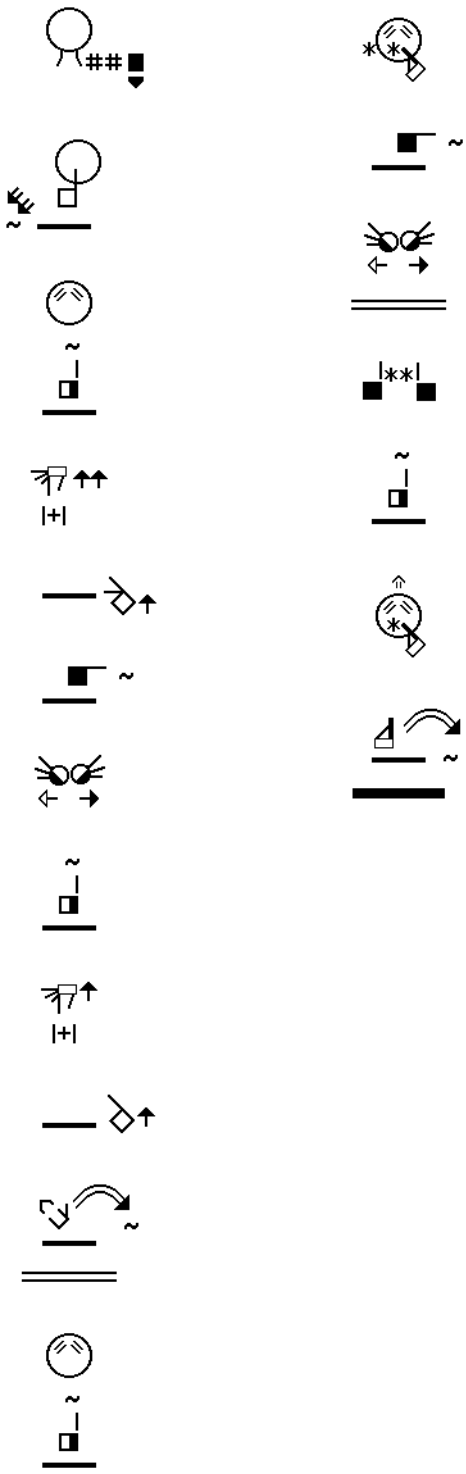
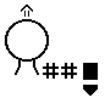
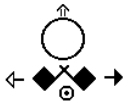
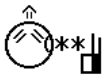


Figure H 4: Modified LSM sentence Luqa3v11.



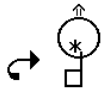
For the following step by step description of changes please compare Figures H1 and H2. The following changes have been made:

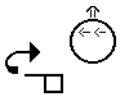
1. All head-tilts marking prosody have been removed, e.g.  (Figure H3) becomes  (Figure H4) and  (Figure H1) becomes  (Figure H2).

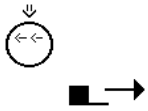
2. The glyphs in the SW sign PAPA' (FATHER) have been repositioned to disambiguate from the similar SW sign DEAF, from  to  .

3. The torso-lift glyphs have been removed from Figure H2 as they are redundant glyphs, thus e.g. from  to  .

4. The pronominal 'key' proposed in Section 10.5 has been applied to the SW signs that use pronominals (pronoun HUMA/THEY 3RD person plural and verb QAL-LILHOM 3rd person indirect object). Thus in Figures H1 to H2:

From  to 

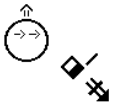
From  to 

From  to 

In Figure H2 the following have been adapted:

From  to 

From  to 

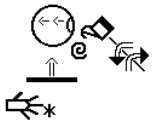
From  to 

5. The SW sign ĊAPĊAP (CLAP)  has been reduced drastically to clearer glyphs and few movement glyphs.

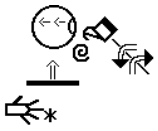
6. Direct discourse is marked with eyebrows raised, however is not written for every single following sign. When a sign contains a head-glyph and it is still direct discourse, the eyebrows raised glyph is included, otherwise this glyph is included in the first SW sign. It is assumed that all that follows will be direct discourse. The punctuation glyph ‘stop’ will end the discourse. If the discourse stretches across a

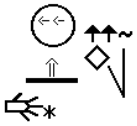
number of sentences, and hence across stop glyphs, at the beginning of each new sentence the head glyph eyebrows up would best be included to mark the continuation of direct discourse. The lexical sign QAL-LILHOM (TELL-THEM) is also a marker of the onset of direct discourse.

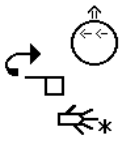
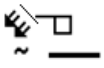
7. In Figure H2 the SW sign SABIH is rewritten by reducing glyphs and positioning SW glyphs to show the location. The contact glyph is removed because the movement glyph and position are enough and this glyph becomes redundant. Thus the SW

spelling  is respelled  .

8. In Figure H4 all the hand-holds that create 'simultaneous words' in one SW box are removed. Thus the following are changed:

From  to 

From  to 

From  to 

9. In Figure H1 the pause glyph that precedes the direct discourse is removed in Figure H2.

10. Shifting SW signs to left right and centre in Figure H3 is removed in Figure H4.

H2 REWRITING LSM SENTENCE GAKKI 5

Figure H 5: Gakki 5 Original

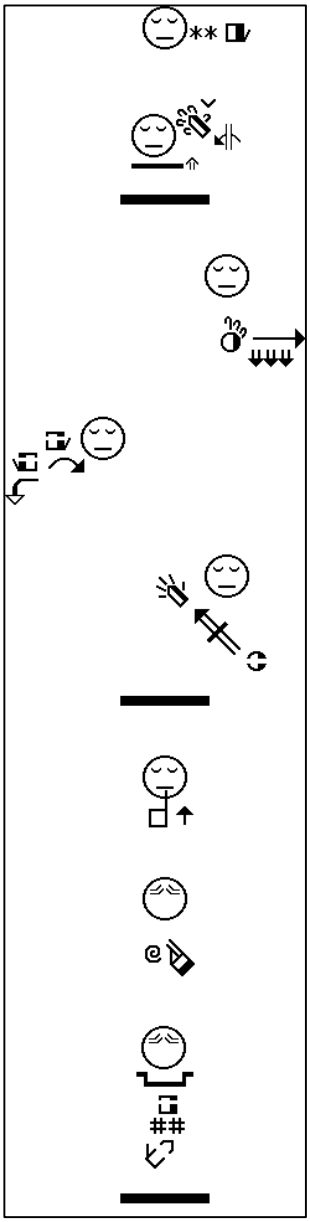
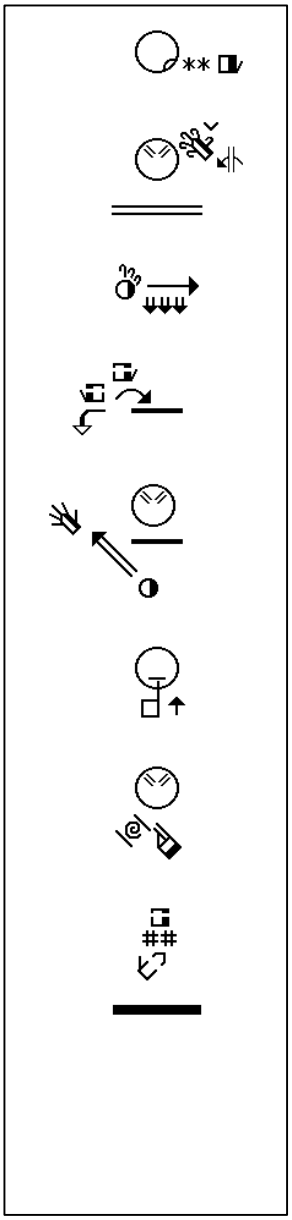


Figure H 6: Gakki 5 re-written



The LSM sentence in Figure H6 has been modified to the sentence in Figure H7, following the recommendations derived from this work. The following modifications have been made to the LSM sentence of Gakki 5 seen in Figure H6.

1. Eyebrows glyph is changed to frown to express anger.

2. Up+Forward Arrow glyph  can be changed to Up glyph (See Section 6.9: redundancy of these arrow glyphs in the LSM texts).

3. Size of arrow glyph is marked as 'long' arrow (see Section 8.10.4 and Section 9.10.3.1).

4. Head glyph is still included for handle classifier verbs THROW-OUT-BEANS. It is argued that for handle classifier verbs the head-glyph and accompanying facial expressions or eye-gaze are significant and mark these as a separate class of handle classifier verbs (Section 11.3.3)

5. It is suggested that the shoulder glyph in last SW sign is removed as it is redundant information.

3. First punctuation glyph a stop is changed to pause. The second punctuation glyph is removed.

4. Since it is an angry direct discourse, angry eyebrows are used to mark onset of direct discourse, rather than eyebrows-up. The lexical sign QAL (SAY) when uninflected is a marker for the onset of direct discourse.

5. The  rub movement glyph is used rather than the  rub glyph. When using rub only it could be read as the handshape rubbing on the chest area (neutral space), by adding the in-between glyph for the rub it might help indicate that the fingers are rubbing against each other.

H3 REWRITING LSM SENTENCE GAKKI 8

Figure H 7: Gakki 8 Original

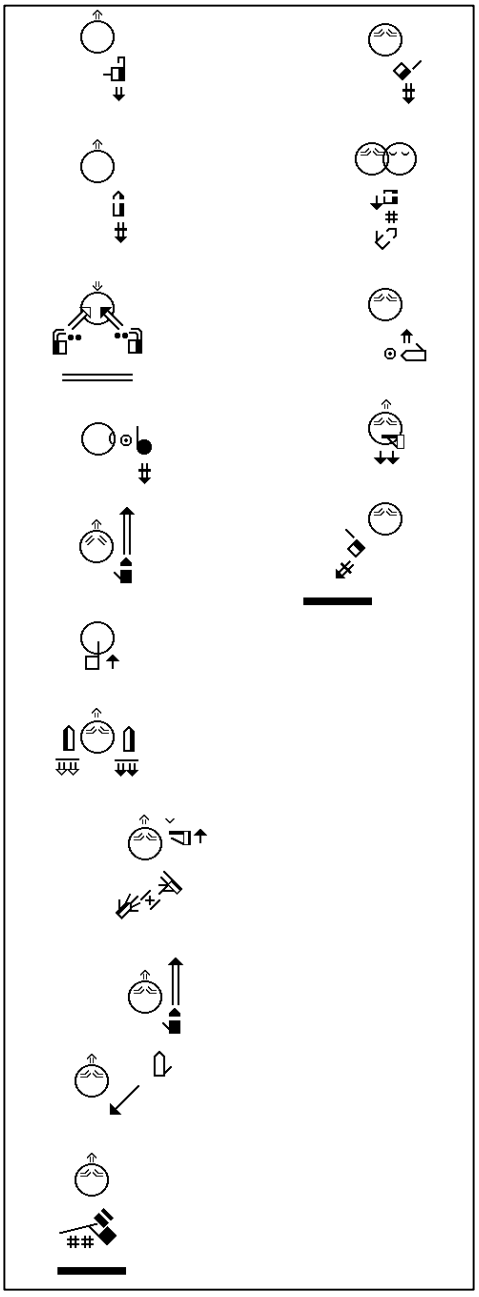
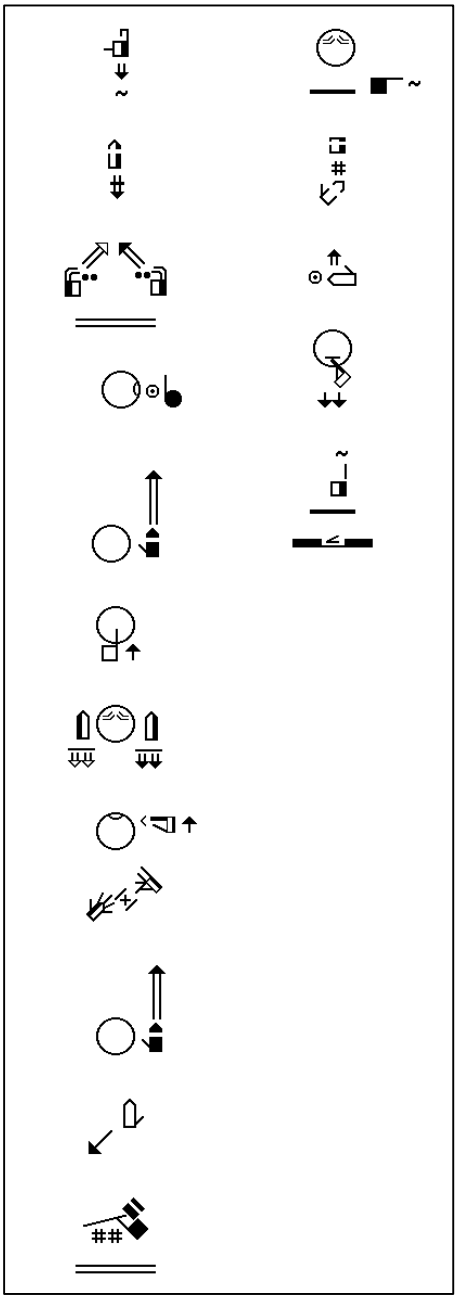


Figure H 8: Gakki 8 Modified



1. The head-tilts marking prosody were removed in H8.

2. A tense glyph is suggested to be placed under fingerspelt letters that mark shortened names, such as ‘Ġ’ marking ‘Ġakki’ here (Figure H8).

3. The concern eyebrow glyph is kept to mark beginning of direct discourse. Like other LSM sentences the SW sign QAL (SAY) marks the beginning of direct discourse.

4. The arrow glyph on the SW sign MARA (WOMAN) is removed as it is redundant when reading the SW sign.

5. To show length of giants the marked long arrow glyph is used. The head glyph is used to show relative length to the arrow glyph.

6. ŻEWĠI ĠGANT (HUSBAND GIANT) shifted to the right in original writing, is moved to the centre in new edition of the sentence.

7. Original writing of HU (HE/HIM) and INT (YOU SG.) are replaced with SW key for LSM pronouns.

8. In SW sign ŻGUR (FOR SURE) the downward movement glyph is removed as it is redundant.

9. Body-related verb KIEL (EAT) includes the mouth glyph in the new spelling to mark this important feature of the verb.

10. Last punctuation glyph, the stop, is replaced with an exclamation glyph in the newly edited sentence of Gakki 8.

H4 REWRITING LSM PRONOMINALS BARNUZA 27

A few examples of modified spellings following the work on LSM pronominals can be seen in Figures H9 to H10.

Figure H 9: Original Barnuza 27

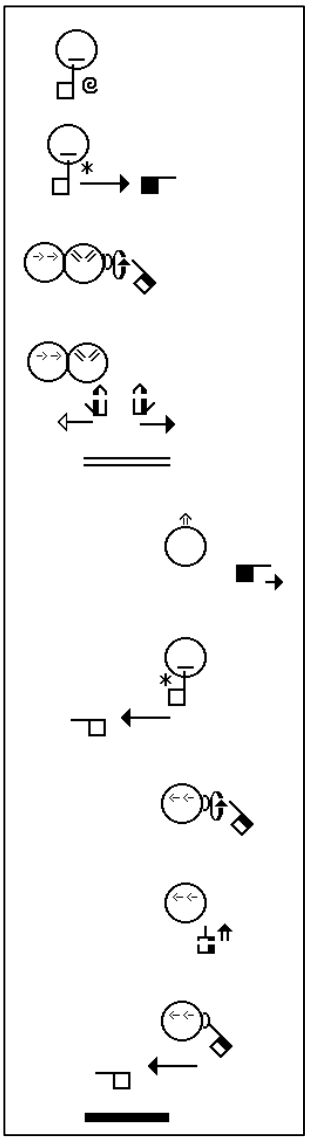
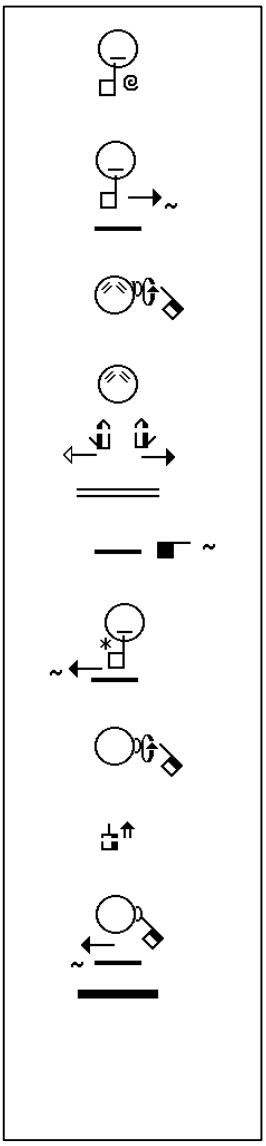


Figure H 10: Re-written Barnuza 27



1. The first phrase is centred and not positioned to the left.

2. QAL-3 PERSUNA (SAY-3RD-PERSON) is rewritten using the SW glyph 'key' (see Section 10.5). Also verbs pronoun HI/HU (HE/SHE) and last sign SEMA'-LILEK is rewritten using this glyph 'key'.

3. Facial expression is changed to neutral eyebrows up that marks the onset of neutral direct discourse.

4. Eye-gaze is removed as it is redundant.

H5 REWRITING WHOLE ENTITY (WE) CLASSIFIER LSM SENTENCE

The LSM sentence is Barnuza 22 and is taken from the LMAP and can be seen in Figure H11. The modified equivalent can be seen in Figure H12.

Figure H 11: Original Barnuza 22

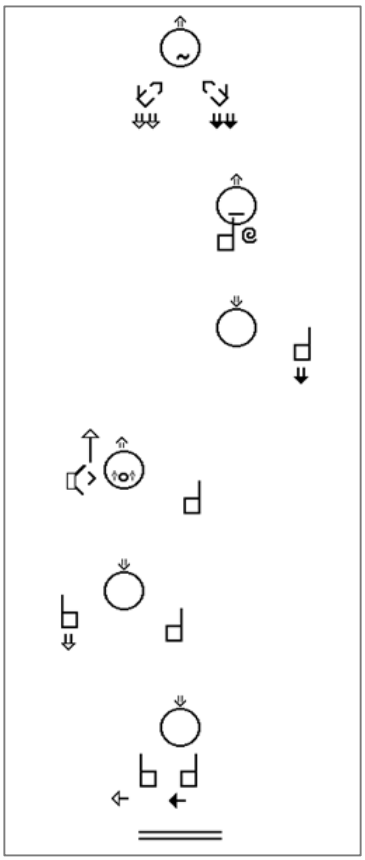
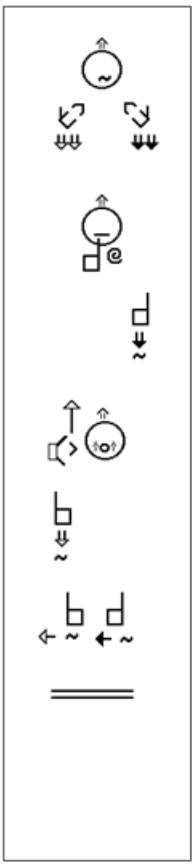


Figure H 12: Modified LSM sentence Barnuza 22



1. Tense glyphs used to mark WE classifiers (see Section 7.6.1).

2. Remove head glyph from WE classifier verbs, since this is a two-handed LSM classifier verb (Section 9.10.2).