Journal of Autism and Developmental Disorders, Vol. 34, No. 2, April 2004 (© 2004)

Brief Report: Cognitive Processing of Own Emotions in Individuals with Autistic Spectrum Disorder and in Their Relatives

Elisabeth Hill,[1,3] Sylvie Berthoz,[2] and Uta Frith[1]

Difficulties in the cognitive processing of emotions—including difficulties identifying and describing feelings—are assumed to be an integral part of autism. We studied such difficulties via self-report in 27 high-functioning adults with autistic spectrum disorders, their biological relatives (n = 49), and normal adult controls (n = 35), using the 20-item Toronto Alexithymia Scale and the Beck Depression Inventory. The individuals with autism spectrum disorders were significantly more impaired in their emotion processing and were more depressed than those in the control and relative groups.

KEY WORDS: Autism; depression; emotion processing; alexithymia.

It is commonly believed that individuals with autistic spectrum disorders (ASDs) have difficulty processing their own and other people's emotions. Emotion dysregulation includes difficulties in identifying and describing feelings; difficulties in distinguishing feelings from the bodily sensations of emotional arousal; impaired symbolization, as evidenced by a paucity of fantasies and other imaginative activity; and a tendency to focus on external events rather than inner experiences (concrete thought). This cluster of cognitive and affective features has been described as the alexithymia construct (Sifneos, 1973) and has been investigated using self-report scales with different populations, including posttraumatic stress disorders and substance-related and eating disorders (see Taylor, 2000, for a recent review).

In this study, we used the 20-item Toronto Alexithymia Scale (TAS-20; Bagby, Parker, & Taylor, 1994a; Bagby, Taylor, & Parker, 1994b) to study emotion processing in a group of high-functioning adults with autistic spectrum disorders. This self-report questionnaire is a reliable and well-validated measure of emotion processing. The TAS-20 allows assessment of the level of difficulty in this domain within three cognitive-affective areas: difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking. Examples of items for each are shown in Table I.

A current theory of the social communication impairments in ASDs proposes that there is an impairment in theory of mind, also referred to as "mentalizing." By this is meant the ability to automatically attribute mental states to others and to implicitly take account of the fact that different people have different thoughts (see papers in Baron-Cohen, Tager-Flusberg, & Cohen, 1993, 2000). This impairment may cause an inability in identifying and describing one's own mental states, including feelings about things. Autobiographies of apparently well-compensated individuals with ASDs indicate some unusual reporting of own feelings, in conjunction with very detailed reporting of bodily sensations (e.g., Grandin and Scariano, 1986). Difficulties with the cognitive processing of emotion, caused by problems in identifying or describing feelings, have been reported to be associated with high rates of

[1] Institute of Cognitive Neuroscience, University College London, United Kingdom.
[2] Department of Psychiatry, Institut Mutualiste Montsouris, Paris.
[3] Correspondence should be addressed to Elisabeth Hill, Department of Psychology, Goldsmiths College, University of London, New Cross, London SE14 6NW, United Kingdom; e-mail: e.hill@gold.ac.uk.

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Table I. Examples of Items for Each Subcomponent of the Toronto Alexithymia Scale

Difficulty identifying feelings:
I am often confused about what emotion I am feeling.
When I am upset, I don't know if I am sad, frightened or angry.
Difficulty describing feelings:
I find it hard to describe how I feel about people.
I am able to describe my feelings easily.
Externally oriented thinking:
I find examination of my feelings useful in solving personal problems.
I prefer to watch 'light' entertainment shows rather than psychological dramas.

Note: Subcomponents are difficulty identifying feelings (seven items), difficulty describing feelings (five items), and externally oriented thinking (eight items). Respondents must indicate on a scale of 1 to 5 whether they strongly agree to strongly disagree (respectively) with each statement.

depression in the general population (Honkalampi, Hintikka, Tanskanen, Lehtonen, & Viinamäki, 2000). We asked participants to complete both the TAS-20 and the Beck Depression Inventory (BDI; Beck, Steer, & Garbin, 1988).

In this study we had two aims. The first was to document via self-report the existence and extent of difficulties in the cognitive processing of emotions in a group of high-functioning adults with ASDs compared with a group of normal adults of similar age and ability. Our second aim was to address whether difficulties with emotion processing are potentially part of a broader cognitive phenotype of autism (see Happé, Briskman, & Frith, 2001). To this end we evaluated a group of biological relatives of individuals with ASDs to investigate the nature of any relationship between measures of emotion processing and depression within and between these groups. First-degree relatives of individuals with ASDs have been reported to experience significantly higher rates of major depressive disorder than is seen in the parents of individuals with tuberous sclerosis complex or seizure disorder (Smalley, McCracken, & Tanquay, 1995) or Down's syndrome (Piven *et al.,* 1991). Psychiatric interview studies provide evidence that personality traits such as social phobia and suspiciousness are elevated in the parents of individuals with ASD (e.g., Piven *et al.,* 1991; Wolff, Narayan, & Moyes, 1988). Very recently, mothers of children with autism or mental retardation have been reported as showing elevated self-reported rates of depression and anxiety in comparison to the mothers of healthy children (Weiss, 2002). In light of such previous studies, we predicted that a relative inability to reflect on, and hence express, their own inner states, as well as depression, would be seen in the biological relatives of individuals with ASDs in comparison to normal controls. We expected that levels of abnormal reflection on own emotions and depression would be higher still in the individuals with ASDs themselves, and that problems of emotional insight would not be explained by levels of depression alone.

METHOD

Participants

A total of 111 people participated in the study: 27 high-functioning adults with ASDs, 35 normal adult controls, and 49 relatives of individuals with ASDs. The adults with ASDs had all received a formal diagnosis of either Asperger syndrome (n = 20) or autism (n = 7). Since to complete the study it was necessary to read and write and, indeed, to complete two questionnaires unaided, all participants had to be high-functioning. These adults were recruited via various support groups and community centers. Thirty-two people received questionnaires, of which 27 (84.4%) returned them fully completed.

Relatives of people with ASDs either were recruited via those included in the adult ASDs group (n = 18), or were the relatives of children involved in other projects that were running in our lab (n = 31). The group of relatives was comprised predominantly of the parents of individuals with ASDs (25 mothers, 16 fathers). Four siblings (two brothers, two sisters), two grandfathers, and two husbands completed the group. The two husbands of women with ASDs who completed questionnaires were not included in the analysis because they were not biologically related to an individual with ASDs. The normal adult control group was recruited from the subject pool at the Institute of Cognitive Neuroscience and from local community centers.

Participant details are given in Table II. Because the gender balance was unequal in the three groups, an analysis of variance of the results was carried out with gender as an independent variable. There was no significant effect of gender on any measure, nor any interaction. There was, in fact, no significant difference between the gender distribution of any group [$\chi^2(2) = 1.19$, $p > .1$]. However, there was a significant difference in the age of the groups [$F(2,107) = 7.83$, $p < .001$]. Post hoc Tukey tests revealed that this difference arose from a significantly older mean age of the ASDs

Table II. Participant Details

	Autism spectrum disorder adults	Normal adults	Autism spectrum disorder relatives
Number	27	35	47
Male (female)	15 (12)	16 (19)	20 (27)
Age (years)			
Mean	35.07	32.18	42.89[a]
SD	12.26	11.25	13.68
Range	16–63	19–62	15–80

[a] Significantly older than Autism Spectrum Disorder adult and normal adult groups ($p < .05$ and $p < .001$, respectively).

relatives group in comparison with both the adults with ASDs and the normal adult control group.

Measures

Emotion Processing and Reflection

The 20-item TAS-20 (Bagby *et al.,* 1994a, l994b) was used to assess levels of cognitive processing of emotion. This is a self-report rating scale that investigates three components of emotion processing: difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking (see Table I). The items are rated by the respondent on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Some items are negatively keyed. The TAS-20 has been shown to possess good psychometric properties (Bagby & Taylor, 1997).

Responses were totalled (range of scores, 20–100) and considered as a continuous variable, as well as being categorized using previously established cut-off scores (Bagby *et al.,* 1994a) to assign participants to a group of those considered to exhibit nonimpaired functioning (score of 51 or less), slight impairment (score of 52–60), or severe impairment (score of 61–100).

Depression

The level of depression was assessed using the 21-item BDI (Beck *et al.,* 1988), in which individuals are asked to respond to statements on the basis of how they have felt over the last week. In this way, the BDI provides an indication of the presence of a depressive episode at the time of the study. Scores were totalled and considered as a continuous variable, as well as being categorized using established cut-off scores to assign participants to a group of those considered to exhibit nondepressed functioning (score of 10 or less), dysphoria (score of 11–14), dysphoria/depression (score of 15–19), or clinical depression (score of 20 or more).

General Procedure

Questionnaires were given or sent out to participants with full instructions and stamped, addressed envelopes for their return. Participants were encouraged to contact the first author (E. Hill) if they had questions concerning completion of the questionnaires. Two adults with ASDs did so, both wanting to confirm the time period on which they should focus when completing the BDI (the last week). Responses from returned questionnaires were included in the analysis only if they questionnaires had been fully completed and if responses on the TAS-20 were not confined to the "neither agree nor disagree" response. Only two individuals did not complete the questionnaires fully (both were adults with an ASD).

RESULTS

Only two out of 27 participants with ASDs phoned us to clarify task instructions, which we had encouraged them to do. These questions related to an uncertainty about whether the BDI was concerned only with the preceding week. No questions were ever asked about the meaning of items on either scale. A handful of questions were left unanswered or marked "neither agree nor disagree," but this was the case in all three groups.

The overall intensity of depression seen in each participant group, as well as the percentage of participants falling into each depression category (nondepressed, dysphoria, dysphoria/depression, clinical depression) are shown in Figure 1. Although none of the normal adults and 6.4% of the relatives fell into the category of clinical depression, 22.2% of the adults with ASDs fell into this category. A more striking difference was seen in the percentage of the groups exhibiting some degree of depression (highlighted by a score of 11 or more on the BDI). Of the adults with ASDs, 75% fell into this bracket, in contrast to 17% of the normal controls and 27% of the relatives group.

A one-factor analysis of variance comparing the total BDI scores of the three participant groups revealed a significant effect [$F(2,108) = 13.7$, $p < .001$]. Post hoc Tukey tests showed that the adults with ASDs differed significantly from the relative and normal adult control groups, but that these latter groups did not differ from each other.

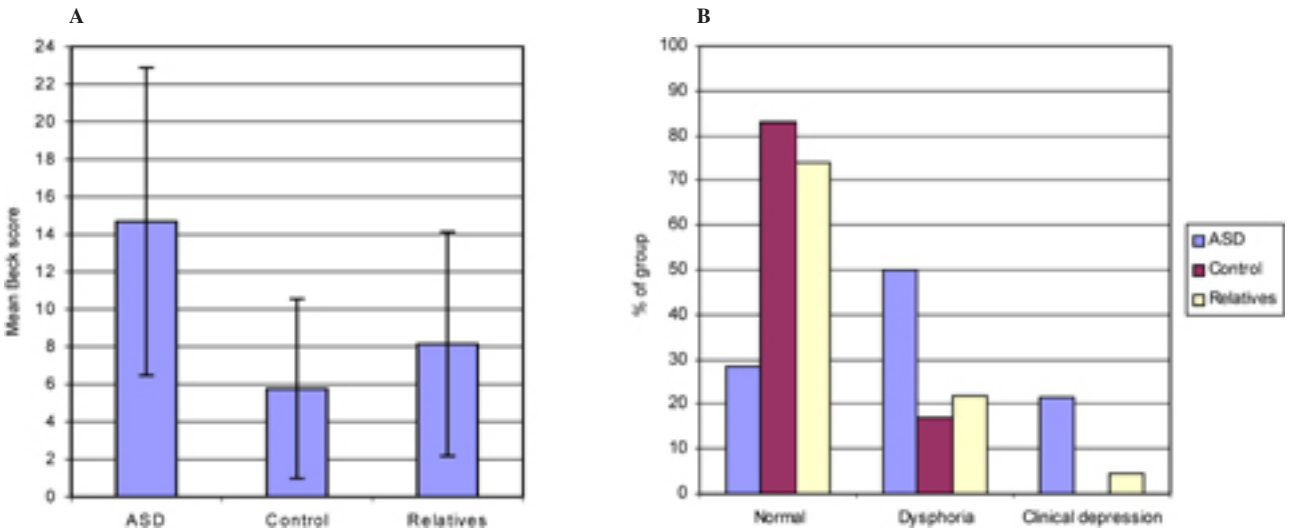

Fig. 1. Intensity of depression depicted by mean group score on the Beck Depression Inventory. Error bars show standard deviation (A). Percentage of each participant group falling into each depression category (nondepressed, dysphoria, clinical depression) on the Beck Depression Inventory (B).

The overall intensity of emotion-processing difficulties, as well as the percentage of participants falling into each category of emotion processing (nonimpaired, slightly impaired, or severely impaired), is shown in Figure 2. Of the adults with ASDs, 14.8% fell within the nonimpaired category, in contrast to 78.7% of the relatives and 82.9% of the normal adult controls. None of the normal adult controls and only one of the relatives fell into the severely impaired category, whereas 13 of the 27 adults with autistic spectrum disorders fell into this category (48.1%). The responses of each group to the three components of emotion processing assessed by the TAS-20 are given in Table III. These data were not subjected to further analysis given the small sample size of the groups.

Given the significant difference between the intensity of depression in the participant groups, a logistic regression analysis controlling for depression was applied to the emotion data for the comparison of the total score on the TAS-20 in the adults with ASDs versus the normal adult controls. There was a significant difference between these two groups once the level of depression had been controlled for, with the adults with ASDs exhibiting a significantly higher level of

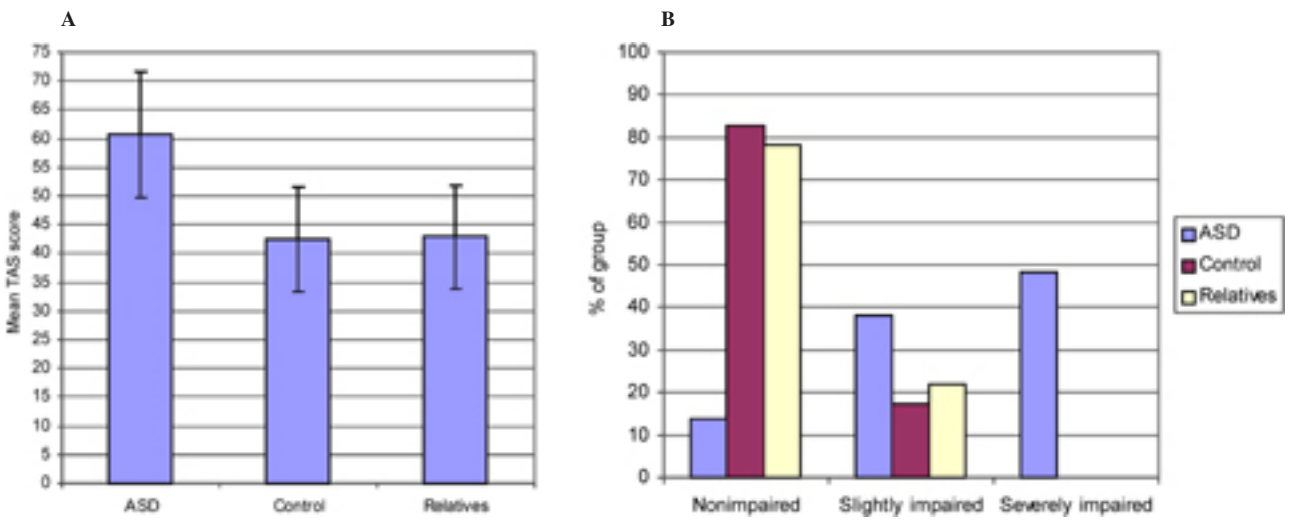

Fig. 2. Mean total Toronto Alexithymia Scale (20 items) for each participant group. Error bars show standard deviation (A). Percentage of each participant group falling into each emotion-processing category (nonimpaired, slightly impaired, severely impaired) on the Toronto Alexithymia Scale (20 items) (B).

Table III. Mean (SD) Scores on the Toronto Alexithymia Scale (20 items) and Its Three Subcomponents

	Autism spectrum disorder adults	Normal adults	Autism spectrum disorder relatives
Difficulty identifying feelings (max = 35)	20.93 (5.73)	15.11 (5.27)	12.51 (4.45)
Difficulty describing feelings (max = 25)	17.59 (3.4)	11.71 (3.49)	12.36 (4.07)
Externally oriented thinking (max = 40)	21.93 (6.28)	15.69 (4.47)	17.53 (4.45)
Total score (max = 100)	60.44 (10.84)	42.51 (9.09)	42.4 (10.07)

difficulty in emotion processing than the adult controls [$Exp(B) = 1.22$, 95% confidence interval (CI) = 1.09–1.37, $p < .001$]. There was no correlation between level of emotion processing and depression in any of the groups [adults with ASDs, $r\,(25) = -.27$, $p > .1$; controls, $r\,(33) = .26$, $p > .1$; relatives, $r\,(45) = .12$, $p > .1$].

Because of the significant difference between the age of the group of relatives in comparison to both the adults with ASDs and the normal adult control group, the logistic regression analysis comparing the responses of the adults with ASDs versus the relatives and normal adult controls versus the relatives on the TAS-20 was set to control for depression and age [adults with ASDs versus relatives, $Exp(B) = 1.17$, 95% CI = 1.09–1.26, $p < .001$; relatives versus controls, $Exp(B) = .99$, CI = .93–1.04, $p > .1$]. Adults with ASDs evidenced a significantly higher level of emotion-processing difficulties than the group of relatives, who did not themselves differ from the normal adult control group in terms of emotion processing.

DISCUSSION

As far as we are aware this is the first study to address directly the issue of the existence of emotion-processing difficulties and their relation to depression by asking high-functioning individuals with ASDs to report their own emotional processes. This study gives some encouragement to the view that such individuals are capable of responding adequately to questionnaires when asked to report their own emotions. Importantly in this respect, some items of the TAS-20 are negatively keyed, and to get a high score (indicative of emotion-processing deficits) on this scale a respondent must be able to understand the questions and to switch their response from one question to another. However, it would be important to show that the same information would be obtained again at another point in time, and that another sample of ASD adults would show the same pattern. It would also be interesting to compare the self-ratings of depression and emotion processing with ratings given by others (using, e.g., the Hamilton Depression Rating Scale, Hamilton, 1967; and the Observer Alexithymia Scale, Haviland, Warren, Riggs, & Gallacher, 2001, respectively). We cautiously believe that we have identified a new tool to understand better the experiences of individuals with ASDs, adding to information from case reports of individuals with ASDs whom others have identified and treated successfully for depression (Lainhart & Folstein, 1994).

The results confirmed our prediction of high rates of emotion-processing difficulties as well as depression in these individuals in comparison with both a group of relatives of individuals with ASDs and normal adult controls. Difficulties in the cognitive processing of emotions existed over and above the high level of depression among high-functioning individuals with ASDs at the time of their participation in the study. The significant group differences that we found go against the possibility that high-functioning individuals with ASDs are unable to provide adequate responses to the questionnaires used in this study. To support this view, we quote illustratively, and directly, from letters sent to us spontaneously by two of the participants with ASDs in which they describe their difficulties and frustrations in this area. “I get so mad when people say ‘got no feelings, can’t relate to me.’ I have feelings—told very deep . . . Trouble is wires crossed so show all this in perhaps odd bizarre fashion or in misplaced way” (a 34-year-old woman with Asperger syndrome). “When I am able to get people to understand me, my view of life is positive, but when I am battling against the prejudice I feel very low. This feeling comes from the powerlessness to change my situation in which I find myself. . . . In formal situations this is not a major problem, but in informal ones it is a crushing one” (a 31-year-old woman with Asperger syndrome).

How can we explain the difficulties in emotion processing, which may reflect a constant trait, and the high rates of depressive symptoms, which may reflect a temporary state? Difficulties were revealed by self reports, both in the questionnaires and through spontaneous

communication. Clearly, some degree of insight into other minds as well as into own mind exists in this able group. Nevertheless, these individuals show difficulty in both identifying and describing feelings. They also show concrete thought patterns; that is, a tendency to focus on external events rather than inner experiences. We suggest that a persistent failure of theory of mind (mentalizing) may be the cause of the emotion-processing difficulties. A similar speculation has been offered by Gillberg and Råstam (1992) in relation to individuals with anorexia nervosa, a psychiatric disorder in which a high prevalence of emotional-processing deficit has been documented (Taylor 1997). In ASD, the persistent failure of mentalizing needs to be seen against a high degree of compensatory learning of social communication difficulties and improvements in self-awareness resulting from experience and motivation. Compensation was typical of our group, as evidenced by their independence and willingness to introspect for the purpose of the questionnaires. Our results indicate that even this degree of compensation is not enough to eliminate emotion-processing difficulties. These may remain telltale signs of underlying theory-of-mind problems in autism ASDs. Because unaffected relatives do not suffer strikingly from an underlying theory-of-mind deficit, they would also not be expected to show the emotion-processing difficulties that can be revealed by the emotion-processing questionnaire.

The elevated rates of depression, a state rather than a trait measure, can be explained in a different way. Whereas the slow compensatory acquisition of an explicit theory-of-mind has made the awareness of inner states possible, at least to some extent, it has also led to an increased awareness of the failure to "fit in." This indicates a cost of compensatory learning that has not always been realized. Increased depression could therefore be seen as a secondary reaction to a theory-of-mind deficit, dependent on specific experiences in the recent past. Another explanation is a primary tendency in ASDs for increased rates of depression. Although we did not find elevated depression symptoms on the BDI in our group of first-degree relatives, we cannot rule out the possibility that a larger sample might identify such a tendency. We are addressing these questions at present, in a larger study.

In conclusion, high-functioning adults with ASDs appear to be able to contribute via self-report questionnaires to the practically important topic of understanding their own emotions. These, admittedly preliminary, results show that these individuals may exhibit severe impairments in the cognitive processing of emotion. In addition, many appeared to be affected by previously unidentified depression at the time of testing.

ACKNOWLEDGMENTS

This research was supported by funding from the Medical Research Council (UK) to U. Frith (grant G9716841). We acknowledge the willing participation of all individuals in this study and thank Dr. Francesca Happé for invaluable comments on an earlier draft of the article.

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