

A Lack of Self-Consciousness in Autism

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Objective: This study investigated self-consciousness in autism.

Method: An incidental memory task was conducted on 18 adults with high-functioning autism and 18 normal comparison

subjects. Three kinds of orienting questions (phonological, semantic, and self-referent, i.e., “Does the word describe you?”) were asked about target words (adjectives for personality traits) in order to induce different types of processing. This was followed by an unexpected recognition test.

Results: While semantic processing resulted in better memory than phonological processing in both groups, self-referent processing yielded better memory performance than semantic processing in the comparison group but not in the autistic group.

Conclusions: The results suggest deficits in self-consciousness in individuals with autism.

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In healthy subjects, semantic processing of verbal materials facilitates episodic memory better than “shallow” (phonological or perceptual) processing, which has been known as the levels-of-processing effect (1). The words processed in a self-referent manner are remembered even better than those processed in a general semantic context, which is called the “self-reference effect” (2). The self-reference effect has been attributed primarily to more effective

encoding by use of a highly organized structure of self-concept (3).

Behaviors that seem to indicate deficits of self-consciousness, such as talking about oneself as if speaking of others, are often observed in people with autism. Impairments in self-consciousness have been supported by behavioral studies that have examined responses of autistic children to a self-recognition test (4). Psychological stud-

ies have also found reduced memory for self-performed events (5), despite intact or even superior memory on conventional tests, as reported in recent studies (6).

If individuals with autism grow up with impaired self-consciousness, then they might not develop a highly organized self-concept. This could result in a lack of the self-reference effect in episodic memory tasks. This study was conducted to examine self-consciousness in individuals with high-functioning autism by using a memory test that was designed to elicit a self-reference effect.

Method

Subjects consisted of 18 individuals (16 men and two women) with high-functioning autism and 18 normal comparison subjects. The autistic and comparison groups were matched for age (mean=23.0 years, SD=5.2, and mean=24.5 years, SD=7.9, respectively) and gender, for visuospatial reasoning ability on Raven's Coloured Progressive Matrices (7) (mean=33.6, SD=2.6, and mean=31.1, SD=4.6), and for verbal IQ (mean=95.3, SD=17.9, and mean=97.2, SD=19.5) and performance IQ (mean=92.1, SD=14.8, and mean=91.2, SD=19.0) on the WAIS-R. The diagnosis of autism was made according to DSM-IV criteria by the first author. The score on the Childhood Autism Rating Scale (8) for the subjects in the autistic group, as assessed by parents or professional psychologists, ranged between 31.0 and 46.5 (mean=37.4). Subjects were recruited by the Health and Medical Services Center of Shiga University, as part of the Project for Supporting Youths With Pervasive Developmental Disorders. They were all free of medication and had no neurological problems, as confirmed by physical examinations and interviews. All participants gave written informed consent.

The task employed in this study was similar to the original self-reference task of Rogers et al. (2). The task consisted of a learning phase, when subjects were asked questions about words to be learned, and a test phase, when a recognition test was conducted. First, verbal materials (90 adjectives for personality traits) were selected from the pool of common words. Thirty of those were used as targets to be learned, and the remaining 60 acted as distracters in the recognition test. Three types of orienting questions were prepared for each target. They were phonological ("Does the word rhyme with —?"), semantic ("Is the meaning of the word similar to —?"), and self-referent ("Does the word describe you?") questions, which were expected to induce phonological, semantic, and self-related processing of targets, respectively. There were also two answer types (yes/no), producing six (three levels $\times$ two answer types) potentially different questions for each target. Of the 30 questions used in a trial, 10 (half "yes" and half "no") were chosen for each of three types. Six sets of 30 question-target pairs were developed by substituting a question about each target for another from six alternatives. Each of the same 30 targets appeared in all six conditions. Three kinds of word recognition sheets, each containing the same 30 targets and 60 distracters with their positions changed, were prepared. Thus, there were 18 (six learning $\times$ three recognition) task conditions.

One of the 18 task conditions was assigned to subjects randomly. In the learning phase, subjects first read a question in a booklet (8 seconds), and a target word printed on a card was presented by an experimenter (2 seconds). Then the subjects were asked to answer "yes" or "no" to the question within 5 seconds after the target presentation. The same procedure was repeated without a break until the last item was shown. In actual trials, six additional question-target pairs that were not used for recogni-

tion tests were presented before (three pairs) and after (three pairs) the 30 relevant pairs in order to eliminate possible primacy and recency effects. Subjects in this phase did not know a recognition test would follow. Immediately after the learning phase, a recognition sheet, which contained the 30 target words and 60 new words, was given to subjects, and they were asked to choose 30 words that they judged as "old" within 5 minutes. Trials were run individually.

Results

In the learning phase, subjects in both groups answered most of the phonological and semantic questions correctly. The rates of incorrect answers to the phonological and semantic questions were 2.2% and 2.8% in the normal comparison group and 1.7% and 1.7% in the autistic group, respectively. There was no significant difference in error rates between groups for either type of question (phonological: $t=0.29$, $df=34$, $p=0.78$, and semantic: $t=0.56$, $df=34$, $p=0.58$, unpaired t test, two-tailed). The average proportions of "yes" responses to the self-referent questions were 61.1% in the autistic and 54.4% in the comparison groups, with no significant difference between groups ($t=1.58$, $df=34$, $p=0.12$, unpaired t test, two-tailed).

In the test phase, each subject chose exactly 30 words, as instructed. Mean rates of correct recognition resulting from phonological, semantic, and self-related processing were 38.8% (SE=5.2%), 70.5% (SE=3.8%), and 83.9% (SE=3.6%), respectively, in the comparison group and 58.5% (SE=4.6%), 77.9% (SE=4.6%), and 77.8% (SE=3.4%) in the autistic group. There was no tradeoff between performance for recognition and accuracy of answers in the learning phase. Preliminary analyses using group (autistic or comparison) by level (phonological, semantic, or self-referent) by answer type (yes or no) in analysis of variance (ANOVA) revealed that answer type did not interact with any other variables. Therefore, this factor was neglected in the following analyses. A group-by-level repeated-measures ANOVA yielded a significant group-by-level interaction (Greenhouse-Geisser $F=5.63$, $df=1.79$, 60.99, $p=0.007$). Post hoc comparisons (Fisher's protected least-significant difference using the same pooled error term for all comparisons) revealed a significant difference in performance for recognition between phonological and semantic processing in both groups (comparison group: $p<0.0001$, autistic group: $p=0.0009$). This indicates that both the autistic and comparison groups showed the levels-of-processing effect. However, a significant difference between semantic and self-referent processing (i.e., self-reference effects) was found in the comparison group ($p=0.02$) but not in the autistic group ($p=0.98$, Fisher's protected least-significant difference). Between-group comparisons showed that recognition resulting from phonological processing was better in the autistic than in the comparison group ($p=0.0005$, Fisher's protected least-significant difference). Otherwise, the two groups did not differ significantly.

Discussion

The autistic group showed a lack of self-reference effects despite intact levels-of-processing effects. These results suggest that the autistic subjects had deficits in self-concept, which lead to problems processing words in a self-related manner. The deficit of self-consciousness is not likely attributable to immaturity in the subjects in the autistic group because they were adults of normal intelligence. Intact memory resulting from semantic processing in the autistic group seems to be consistent with results of recent studies (6). Of interest, the autistic subjects showed better memory resulting from phonological processing than the normal comparison subjects. This might reflect enhanced attention to “shallow” aspects of perceived materials. The deficits of self-consciousness suggested in this study might underlie idiosyncrasies not only in behaviors but also in language, such as the reversals of first- and second-person pronouns, which require a self/other perspective for their proper use. Further investigation of self-consciousness may provide a clue to a better understanding of autism.

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