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Emotion-Related and Abstract Concepts in Autistic People: Evidence From the British Picture Vocabulary Scale[1]

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Autistic and nonautistic retarded adolescents and young adults, individually matched for chronological age and performance on the British Picture Vocabulary Scale (BPVS; Dunn, Dunn, & Whetton, 1982), were compared on those items of the BPVS that independent raters judged (a) emotion-related and (b) highly abstract. Compared to control subjects, autistic individuals scored lower on emotion-related vis-à-vis emotion-unrelated items, an effect that could not be attributed to the "social content" of the items. However, autistic and nonautistic subjects achieved similar scores when responding to highly abstract vis-à-vis "concrete" words of the BPVS. The findings suggest that autistic individuals have specific impairments in grasping emotion-related concepts. They also suggest the need for further study of autistic and nonautistic retarded subjects' difficulties in abstracting. The results have a bearing on the interpretation of the BPVS and on the use of this test as a matching procedure.

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INTRODUCTION

Kanner (1943) proposed that autistic children "have come into the world with innate inability to form the usual, biologically provided affective contact with people" (p. 250). In keeping with Kanner's proposal, there is now experimental evidence that autistic children may be abnormal in the extent to which they attend to, discriminate, and understand bodily expressions of emotion in other people (Hobson, 1986a, 1986b; Jennings, 1973; Weeks & Hobson, 1987). The question arises whether autistic individuals might also have difficulty in grasping concepts that arise out of, or are otherwise related to, the understanding of affect. A further question concerns the specificity of any such conceptual deficit and, in particular, whether it might be attributable to autistic individuals' incomprehension of all social objects and events, or perhaps to broader impairments in their understanding of abstract concepts.

The primary issue addressed in the present study is whether autistic individuals' limited understanding of emotion-related concepts is out of keeping with their understanding of emotion-unrelated meanings in everyday objects and events, especially as such meanings are represented in language. A second issue concerns autistic individuals' problems with abstract vis-à-vis concrete concepts. The British Picture Vocabulary Scale (BPVS; Dunn, Dunn, & Whetton, 1982) was used to provide a sample of words and drawings with each kind of meaning, and with high and low degrees of abstractness. Given this methodological approach, the previous studies of most relevance are those that have analyzed the performance of atypical subject groups on the Peabody Picture Vocabulary Test (PPVT; Shipe, Cromwell, & Dunn, 1966; Atlas, 1986), and Tager-Flusberg's (1985a, 1985b) investigations of the conceptual basis for referential word meaning and picture categorization. The former studies are considered at a later point in the Introduction. Concerning conceptual function, Tager-Flusberg (1985a) examined the range of referents to which verbal mental age (Peabody) matched autistic, nonautistic retarded, and normal children applied particular words. The children's tasks were to indicate whether a pictured object was an instance of a particular word and to select from an array of pictures those that belonged to the category named. All the words examined made reference to concrete objects without obvious emotional significance, for example, kinds of bird, boat, food, and tool. The pattern of performance was the same for all three groups of children. Tager-Flusberg (1985b) also employed a matching-to-sample procedure to test the same groups of subjects for their ability to associate pictures according to basic level and superordinate categories. The superordinate categories were divided into two groups, one biological (vegetable, fruit, and animal) and the other artifactual (clothing, furniture, and vehicle). The results yielded evidence that the nonautistic

retarded subjects were less able than the other two groups in superordinate level categorization, but there was no evidence for such impairments amongst the autistic subjects. Tager-Flusberg made the tentative suggestion that the difference between the nonautistic and autistic retarded subjects might be ascribed to the lower IQ of the former group (nonautistic retarded subjects' mean IQ 44, *SD* 8; autistic subjects' mean IQ 51, *SD* 16). She also noted that the correlations between abstract categorization and PPVT scores were relatively high for all subject groups. The present investigation was designed to further the study of autistic and nonautistic retarded individuals' concepts by focusing upon particular kinds of concepts in relation to others. The concepts in question included a class that was not represented in Tager-Flusberg's studies, namely, the class of emotion-related concepts.

Thus our approach was to examine autistic and matched nonautistic retarded subjects' profiles of performance on a standard vocabulary test involving the matching of words and pictures, the BPVS. Performance on the BPVS, a British version of the Peabody Picture Vocabulary Test (Dunn & Dunn, 1981), is probably representative of results obtained with other receptive vocabulary tests of similar form. Individuals are presented with a series of plates in which drawings are arranged in groups of four. Subjects are given instructions such as, "Point to . . . dentist," or, "Show me . . . surprise," and they respond by indicating the appropriate picture. The originators of the test describe how the BPVS was designed to measure a subject's receptive (hearing) vocabulary for standard English. This may also be considered a test of an individual's concepts insofar as he or she has to recognize the correspondence between the meaning of each word and the meaning of a picture. Such conceptual understanding may be of a minimal kind. It is for this reason that the use of the Picture Vocabulary Test has been criticized as a measure of mental age (MA) in retarded populations, in that these subjects may attain misleadingly high scores on such single-word vocabulary tests when they only partly comprehend the items presented (Burland & Carroll, 1971; Wheldall & Jeffree, 1974). In keeping with this view, Tubbs (1966), Prior (1977), Wetherby, Koegel, and Mendel (1981), and Tsai and Beisler (1984) have provided evidence that some autistic children score more highly on the PPVT than on more complex tests of language comprehension or production, even though they may score less highly than on verbal subtests of the WISC or WAIS (Lockyer & Rutter, 1970). Thus a retarded subject's score on the BPVS might be a conservative measure of that person's limitations in understanding. However, it is possible to compare and contrast two groups of retarded individuals—one autistic and the other nonautistic—on specific items of the BPVS that might give more or less difficulty to the subjects of one or the other group.

To adopt such an approach, and to explore the contrasting processes by which different subject groups might be achieving similar overall levels

of performance on a test of intelligence, is to follow a tradition of research into mental retardation and special cognitive ability which dates back to the beginning of the century (Spitz, 1982). The immediate stimulus for the present study was somewhat unusual, however. At the time we tested subjects on the BPVS, our intention was to match individuals as a preliminary undertaking before testing subjects on specific tests of emotion- and object-recognition (Hobson, Ouston, & Lee, 1988a, 1988b, 1989a, 1989b). It was only after these latter studies had provided evidence for autistic subjects' specific disability in emotion recognition, but only patchy evidence that such disability was more severe than would be predicted from subjects' BPVS scores, that we returned to investigate the nature of the BPVS itself. Our principal hypothesis was that autistic individuals are specifically impaired in their "affective" understanding. Correspondingly, we predicted that autistic individuals would differ from matched nonautistic retarded individuals in performing less well on those items of the BPVS which had emotional content vis-à-vis items with nonemotional content.

Our aim was then to evaluate whether social content, or more narrowly defined "human content," might contribute to group differences in subjects' profiles of scores. Previous studies with the PPVT have provided suggestive evidence that mildly retarded children and abolescents (Shipe et al., 1966) and children with severe developmental disorders including autism (Atlas, 1986) perform less well on items with human content than on items with nonhuman content. In these studies, human content was defined according to whether the PPVT plates under consideration featured human beings. The specificity of these findings remains open to question in two respects. First, the findings seem to be specific neither to mental retardation nor to autism, so the range of subjects performing in the manner described is still to be determined. Second, it is unclear which kinds of meaning in the items were pertinent to the observed profiles of performance. For in certain respects, human beings may be judged as if people were "things," whereas in other respects human beings have essentially personal–social characteristics. Accordingly, we devised a new method to rate the social content of the BPVS items, one that correpsonded closely with our approach to estimating emotional content. In accordance with previous studies, we also analyzed the data according to the human content of the BPVS plates (i.e., with reference to the four pictures constituting each of the plates, rather than with reference to individual word–picture items).

Finally, we turned to the issue of autistic and nonautistic retarded individuals' capacities to understand abstract concepts. This is relevant because many emotion-related concepts might be considered relatively abstract. It is also an issue that has importance in its own right. There is a long history

of experimental research into nonautistic retarded subjects' impairments in abstraction (e.g., Badt, 1958; Griffith & Spitz, 1958; Luria, 1963, chap. 7). Such difficulties with abstraction might contribute to retarded subjects' poor performance on verbal subtests of the Wechsler scales (e.g., Baroff, 1959; see review by Spitz, 1982). Autistic individuals are also said to think concretely and to have difficulties in abstracting (e.g., Kanner, 1943; Scheerer, Rothmann, & Goldstein, 1945; Ricks & Wing, 1975). Those of lower intellectual ability also perform poorly on most verbal subtests of the WISC (Lockyer & Rutter, 1970). In order to justify claims that deficits in abstracting are specific to autism, direct comparisons between closely matched autistic and nonautistic retarded subjects are required. Few such studies have actually been conducted. Relevant here are experiments on autistic subjects' recall of semantically related verbal material (Fyffe & Prior, 1978; Hermelin & O'Connor, 1967), but the aforementioned studies of Tager-Flusberg (1985a, 1985b) constitute the most direct examination of the issue. As we have seen, Tager-Flusberg's findings suggested that at least in certain conceptual domains and under certain testing conditions, neither autistic nor nonautistic retarded children lack the abstracting abilities required for an understanding of superordinate conceptual categories.

Our prediction was that whatever the impairments of autistic and nonautistic retarded subjects on highly abstract vis-à-vis nonabstract (concrete) items of the BPVS, such impairments would not account for autistic subjects' low scores on emotion-related items.

METHOD

Subjects

The autistic subjects were 21 adolescents and young adults who satisfied the criteria of Rutter (1974) in having early onset of a profound and general failure to develop social relationships, language retardation, and ritualistic or compulsive phenomena associated with repetitive and stereotyped play patterns. There were 18 males and 3 females. The autistic subjects were individually matched with nonautistic retarded subjects according to chronological age and performance on the BPVS (Table I). The nonautistic retarded subjects were selected from three special schools and two Adult Training Centres. Individuals with features of sensory impairment or autism were screened out prior to testing. There were 16 males and 5 females. Only 3 subjects had a specific medical diagnosis, that of Down's syndrome.

Table I. Subjects

		Age			BPVS (raw score)		
	n	Mean (years;months)	*SD* (months)	Range (years;months)	Mean	*SD*	Range
Autistic	21	18;09	45	12;05–25;10	65.5	16.6	44–99
Nonautistic retarded	21	18;05	47	12;06–25;10	66.5	17.4	41–99

Procedures

The materials for the study comprised the British Picture Vocabulary Scale (Dunn, Dunn, & Whetton, 1982). As noted above, the present subjects were originally given this test as a matching procedure. For this reason, subjects who completed later items successfully and met the BPVS criterion of eight consecutive correct responses were not tested on the very easiest items. Nevertheless, each autistic subject was matched with a nonautistic subject who had a similar BPVS score. (Mean difference in the scores of matched pairs was 1 point, *SD* 3.92, see Table I.) In achieving similar net scores, matched subjects tended to differ slightly in the number of items they attempted. For the purposes of the present study, consideration was given only to those items administered to both subjects in each of the matched pairs.

Emotional Content

The materials of the BPVS were rated by five normal young adults who were unaware of the nature of the main study. They were presented with the following typed instructions:

> We shall be most grateful for your help with a difficult task. This is to evaluate what goes into judgements on a standard intelligence test for children.
>
> We would like you to do the test, and make the following evaluation of *what goes into your judgment.* In each case, you will be given a word and be asked to choose the picture that goes with the word.
>
> EMOTIONAL CONTENT:
>
> We would like you to rate each judgment as follows:
> In making the choice of picture to correspond with the word,
> Score 0. My judgement did *not* have reference to emotion, to any significant degree.
> Score 1. My judgement probably did have reference to emotion, to some significant degree.
> Some 2. I definitely made a judgment concerning emotion. The emotion was explicit.
> N.B. Our emphasis is on the *meaning of the word.*
> Examples:

The word "screaming" with reference to the picture of a person screaming with pain would score 2 for emotion.

The word "victorious" with respect to a picture of a general celebrating victory in battle would score 1 for emotion. The word "waving" with reference to the picture of a person waving would score 0 for emotion unless the person was crying, when it would score 1 because this emotion is *both* strong and relevant for the meaning of "waving."

The word "stealing" with reference to a picture of theft would score 0 for emotion even though the person might be feeling things.

PS It will be rare for items in the following task to score 1 or 2—mostly they will score 0.

These instructions were read through with each rater before the BPVS was administered. The intention was to provide raters with a strategy by which they might evaluate whether emotion was intrinsic to each item. Our advice to score most items at zero was to dissuade raters from weighing up ubiquitous but often idiosyncratic or vague emotional connotations of given word–picture combinations.

Social Content

The scoring instructions to raters took a similar form to that described above, except that the term "emotion" was replaced by "social content," and the explanatory text read as follows:

The following is intended to clarify what we mean by "social." 'Social' refers to interpersonal (and in the case of animals, inter-individual) content, i.e., where relatedness between/among individuals is *pivotal* for the meaning of the term. If the term has "social" meaning *but* it can be appreciated to some degree without being anchored to social relatedness or relationships, then score 1.

Examples:

I) The word "reuniting" with reference to a picture of sticking together two broken fragments would score 0 on social content; the word "reuniting" with reference to a picture showing relatives coming together after a separation would score 2 for social content.

II) The word "doctor" in relation to a picture of someone in a doctor's coat and with a stethoscope would score 1 for social content, since the doctor might be "recognized" with minimal reference to his/her interpersonal relationships (he/she might as easily have been a care mechanic with a spanner): but the word "patient" in relation to a picture of a person being examined by a doctor would score 2 for social content, since the patient is completely defined and recognized by his/her role vis-a-vis the other person.

Similarly, a "milkman" with milk bottles would score 0 on social content, whereas "slave" would score 2.

Human Content

A single rater determined which of the first 120 BPVS picture plates had human content. Although it is unclear how one should classify pictures of isolated parts of the body (e.g., a disembodied hand or ankle), Shipe et

al. (1966) referred to BPVS plates as having human content if they contained "pictures of human beings" (p. 440). In adopting this criterion, we excluded bits of the body from the human content category. In each of the plates designated to have human content, all four pictures that appeared on the plate depicted human beings (BPVS plate 83—silhouette—contained only one picture of a human being, and was not included here).

Abstract Content

The method in this case was different in that five new raters were asked to judge the words in isolation, rather than to judge the word–picture combinations. The rationale for this procedure was that it complied with the method of Spreen and Schultz (1966) and Paivio, Yuille, and Madigan (1968), and we wished to establish comparability between our ratings and those reported by these earlier authors. In addition, our aim was to assess the abstract concept embodied in each word, a concept which then found expression in the BPVS picture. It is not easy to rate concepts according to degree of abstractness, and we considered that if raters were given pictures, they might be distracted by other (either more or less abstract) features of the pictures than those exemplified by the words. The instructions read:

> Words may refer to persons, places and things that can be seen, heard, felt, smelled or tasted or to more abstract concepts that cannot be experienced by our senses. The purpose of this experiment is to rate a list of words with respect to "concreteness" in terms of sense experience. Any word that refers to objects, materials or persons should receive a high concreteness rating; any word that refers to an abstract concept that cannot be experienced by the senses should receive a low concreteness rating. Think of the words "chair" and "independence." "Chair" can be experienced by our senses and therefore should be rated high concrete; "independence" cannot be experienced by the senses as such and therefore should be rated as low concrete (or abstract). (Adapted from Paivio et al., 1968).

There were additional instructions of the kind administered by Paivio et al. (1968, p. 4), informing raters how to make their judgments on a 7-point scale. Examples were provided, as follows: knife, score 7; marriage, score 4; style, score 3; freedom, score 1 (adapted from items appearing in Spreen & Schulz, 1966).

RESULTS

A relatively large number of matched-pairs analyses were conducted, so we have had to be selective in choosing which results to present in detail. We provide most information on two sets of results: (a) those concerning emotion-related items, which yield the most specific significant results, and (b) those concerning abstract items which were not emotion-related, since

Table II. Items of the BPVS with Emotional Content[a]

No. in BPVS	Item	Mean score for emotional content (maximum = 2.0)
	Emotion-related items[b]	
28	Horror	2.0
40	Delighted	2.0
46	Disagreement	1.6
52	Surprise	2.0
56	Greeting	1.0
67	Snarling	1.0
97	Embracing	1.2
114	Tranquil	1.0
	Other items with some degree of emotional content	
25	Sharing	0.8
30	Delivering	0.4
41	Tugging	0.2
59	Entertainer	0.2
69	Isolation	0.4
74	Applauding	0.6
76	Predatory	0.2
95	Catastrophe	0.4
96	Departing	0.2

[a]No ratings were made beyond BPVS item no. 120.
[b]Emotion-related items were those with a mean score of 1 or more out of 2 on emotion ratings.

they provide the least ambiguous evidence on subjects' abstracting ability. The remaining results are presented in outline only.

Emotion-Related Items

All items of the BPVS up to no. 120 (the maximum attempted by any subject) were rated for emotional content on the 3-point scale (0, 1, and 2) by five adult judges. With one exception, all judges were within 1 point of agreement with each other on every single item. The exception was that on the item "snarling," one judge gave a score of 0, one judge gave a score of 2, and three judges gave a score of 1. Most items received a score of 0; mean scores for the remaining items are given in Table II.

It was decided a priori that emotion-related items comprise those with a mean weighted emotion score of 1 or more (i.e., corresponding to the normal adults' rating: "My judgement probably did have reference to emotion, to some significant degree"). This criterion was met by approximately half of the total sample of items with emotional content (8 out of 17 items; see Table II). Each subject's performance on these items was then compared with

their performance on nonemotion items (i.e., those with 0 score for emotional content) which were approximately equal in difficulty, as represented in the BPVS. For these purposes, scores of 0 (incorrect) or 1 (correct) were given to the four nonemotion items that were nearest in level of difficulty to the respective emotion item (i.e., nearest in number on the BPVS). In most cases these items were the two nonemotion items immediately preceding and the two immediately following each emotion item. The total was divided by 4 to yield a mean nonemotion score out of 1 to correspond with each emotion item. Overall, therefore, the maximum possible scores were 8 for emotion items and 8 for nonemotion items. The scores attained by matched pairs of subjects, together with the number of emotion-related items attempted by each pair, are given in Table III.

A full repeated-measures two-way analysis of variance of diagnosis (autistic, nonautistic retarded) by type of item (emotion, nonemotion) for matched pairs revealed no significant main effect of diagnosis, a significant main effect of type of item with higher scores on the nonemotion items, $F(1, 20) = 10.85, p < .01$, and a significant interaction of diagnosis by type of item, $F(1, 20) = 5.89, p < .05$. Of course, the main effect of type of item can only be interpreted in terms of the significant interaction of diagnosis by type of item. It may be observed from the aggregate scores given in Table III that for nonautistic subjects, the nonemotion and emotion items were, as expected, approximately equal in difficulty. There was a crossover in nonautistic and autistic subjects' relative performance on the nonemotion and emotion items, and autistic subjects had significantly lower scores than nonautistic subjects on the emotion items (related $t = 2.79, p < .01$; in this and subsequent tests for simple effects, pooled estimates of error variance were used). When each of the 8 emotion-related items was considered in turn, we found that on all but one of these (greeting), there were more autistic than nonautistic subjects who had responded incorrectly. In fact, most subjects attempted only 5 or 6 of the emotion-related items (Table III), so that this constitutes a stringent test for group differences. Of the 6 items judged by most pairs of subjects, 5 were nouns (including 3 gerunds; greeting, snarling, and embracing, which may be considered verb forms), and 1 was an adjective. The 24 nonemotion words with which they were compared comprised 22 nouns (including 2 gerunds) and 2 adjectives. It is therefore unlikely that the group differences were determined by the word forms in which the emotion-related concepts were expressed. The possibility remains that other linguistic factors might have influenced the pattern of results.

Items with Social Content

Once again items were rated for social content on a 3-point scale by five adult judges. Judges were within 1 point of agreement with each other

Table III. Performance of Matched Pairs of Subjects on Emotion-Related and Matched Nonemotion Items

Subject pair[a]	No. of Em items attempted	Autistic (A)			Nonautistic (NA)			
		NEm[b]	Em[c]	NEm − Em d(A)	NEm[b]	Em[c]	NEm − Em d(NA)	d(A) − d(NA)
1	8	7.00	6.00	+1.00	6.00	7.00	−1.00	+2.00
2	8	6.00	5.00	+1.00	6.50	7.00	−0.50	+1.50
3	7	5.50	5.00	+0.50	6.25	7.00	−0.75	+1.25
4	7	6.25	2.00	+4.25	5.25	7.00	−1.75	+6.00
5	7	5.50	5.00	+0.50	6.25	7.00	−0.75	+1.25
6	6	5.00	6.00	−1.00	5.50	5.00	+0.50	−1.50
7	6	4.50	5.00	−0.50	5.50	6.00	−0.50	0.00
8	6	5.25	2.00	+3.25	4.75	4.00	+0.75	+2.50
9	6	5.00	4.00	+1.00	4.00	3.00	+1.00	0.00
10	6	5.00	4.00	+1.00	5.00	4.00	+1.00	0.00
11	6	5.25	5.00	+0.25	4.50	4.00	+0.50	−0.25
12	6	4.75	3.00	+1.75	4.00	3.00	+1.00	+0.75
13	5	5.00	3.00	+2.00	3.75	3.00	+0.75	+1.25
14	6	5.00	2.00	+3.00	4.25	3.00	+1.25	+1.75
15	6	5.00	2.00	+3.00	4.00	6.00	−2.00	+5.00
16	6	4.00	5.00	−1.00	4.50	4.00	+0.50	−1.50
17	5	3.50	2.00	+1.50	3.75	3.00	+0.75	+0.75
18	5	3.00	1.00	+2.00	2.75	5.00	−2.25	+4.25
19	5	3.50	4.00	−0.50	3.50	1.00	+2.50	−3.00
20	5	3.25	3.00	+0.25	2.75	2.00	+0.75	−0.50
21	5	2.75	2.00	+0.75	2.25	4.00	−1.75	+2.50
	Aggregate:	100.00	76.00		95.00	95.00		

[a]Subject pairs are ordered in terms of BPVS score (pair 1 with highest scores, pair 21 with lowest).
[b]Nonemotion items (i.e., score 0 for emotional content). NEm scores were calculated as mean scores (see text) so that not all are integers.
[c]Emotion-related items (i.e., score 1 to 2 for emotional content).

on every item. That is, there were no instances in which an item was considered to be social-related by one of the judges, and devoid of social content by another. Most items received a score of 0; those items with a mean score of 1 or more are given in Table IV.

We adopted two approaches to analyzing the results. The first approach allowed direct comparison with the previous results concerning emotion-related items. Since there had been 8 such emotion-related items, we considered subjects' scores on the 8 items weighted most highly for social content. For each of these items, scores of 0 or 1 were given to the four nonsocial items that were nearest in level of difficulty to the respective social item. The total was then divided by 4 to yield a mean nonsocial score out of 1 to correspond with each social item. Overall, therefore, the maximum possible scores were 8 for nonsocial and 8 for social-related items.

It should be noted that the 8 items with highest social content included 3 emotion-related items (disagreement, greeting, and embracing). Eleven pairs of subjects were administered 7 or 8 of the social-related items, 4 pairs judged 5 or 6 items, and 6 pairs judged only the easiest 3 or 4 items. The "nonsocial minus social" difference scores of autistic subjects were higher than those of matched nonautistic subjects in 11 pairs of subjects, lower in 9 pairs, and equal in 1 pair. A two-way analysis of variance of diagnosis by type of item for matched pairs yielded neither significant main effects nor a significant interaction.

The second approach was to consider all 17 items with a score of 1 or more for social content and to use the usual method to compare those with nonsocial items of comparable difficulty. The 17 items still included only 3 emotion-related items. Eleven pairs of subjects attempted 13 or more of the 17 social-related items, and all subjects judged at least 9 of them. In 15 out of 21 pairs of subjects, the autistic subject had a higher "nonsocial minus social" difference score than his or her matched nonautistic counterpart. Nevertheless, a two-way analysis of variance of diagnosis by type of item revealed no main effect of diagnosis, a significant main effect of type of item, $F(1, 20) = 9.63$, $p < .01$, with higher scores on the social items, but no significant interaction.

BPVS Plates with Human Content

Of the first 120 plates of the BPVS, 30 contained pictures with human beings. As the easiest one of these plates (reading) was not attempted by the present subjects, only 29 human content plates were considered in the following analysis. It has already been noted that to allow comparison with previous studies, human content was evaluated with reference to the four pictures on each BPVS plate, and not with reference to the word–picture combinations that constitute particular items. However, we adopt the shorthand of

Table IV. Social-Related Items of the BPVS[a]

No. in BPVS	Item	Mean score for social content (maximum = 2.0)
16	Accident	1.0
25	Sharing	2.0
26	Dentist	1.2
30	Delivering	1.4
41	Tugging	1.4
43	Teacher	1.0
46	Disagreement	1.8
50	Waiter	1.0
56	Greeting	2.0
59	Entertainer	1.6
69	Isolation	1.6
74	Applauding	1.6
76	Predatory	1.8
85	Stunt	1.2
92	Lecturing	1.8
96	Departing	1.0
97	Embracing	2.0

[a]No ratings were made beyond BPVS item no. 120. Social-related items were those with a mean score of 1 or more out of 2 on social ratings.

referring to human and nonhuman items. Nine pairs of subjects judged at least 21 items with human content, and all subjects judged at least 15 of them. Given the relatively high proportion of such items, scores of 0 or 1 were given to the two nonhuman items that were nearest in level of difficulty to the respective item. The total was then divided by 2 to yield a mean nonhuman item score out of 1 to correspond with each human item.

The results were that in 17 of 21 pairs of subjects, the autistic subject had a higher "nonhuman minus human" difference score than his or her matched nonautistic subject. A two-way analysis of variance of diagnosis by type of item (human, nonhuman content) for matched pairs revealed no significant main effects, but a significant interaction of diagnosis by type of item, $F(1, 20) = 7.40$, $p < .05$). An analysis of simple effects revealed that the superiority of autistic over nonautistic subjects on nonhuman items was not significant, but the autistic subjects had significantly lower scores than nonautistic subjects on the items with human content (related $t = 3.22$, $p < .01$).

Abstract Items

Five raters had score the BPVS items up the no. 120 on a 7-point scale for degree of abstractness. Since 17 of the BPVS words appear in the list

compiled by Paivio et al. (1968), it was possible to compare our judges' ratings of the "concreteness" of these items with ratings recorded in the earlier study. The ranking of these 17 items according to their relative degree of concreteness/abstractness was similar in each study (Spearman rank correlation coefficient $r(s) = .88$, $df = 15$, $p < .001$).

In accordance with the approach adopted so far in this study, the mean rating of concreteness for each item was calculated, and these values were employed to yield three categories of item: (a) abstract, mean score 1–3; (b) intermediate abstract, mean score 3.1–5; and (c) concrete, mean score 5.1–7. When categorized in this way, there were no abstract items that any judge had rated as concrete, nor any concrete item that a judge had rated as abstract (although there was more diversity of opinion over certain items of intermediate status). The 21 abstract items appear in Table V.

Once again, two methods of analysis were employed. The first method was to select the 8 most abstract items (as it turned out, those with mean scores of 1–2 for degree of concreteness) and to compare these with concrete items of comparable difficulty on the BPVS. Since a large number of items were classified as abstract or intermediate abstract, the mean score of just two concrete items corresponding to each abstract item was calculated. The

Table V. Abstract Items of the BPVS[a]

No. in BPVS	Item	Mean score for concreteness (maximum = 7.0)
9	Time	2.4
25	Sharing	1.8
28	Horror	2.0
30	Delivering	2.2
40	Delighted	2.0
46	Disagreement	1.8
48	Pair	2.6
52	Surprise	1.6
56	Greeting	2.6
67	Snarling	3.0
69	Isolation	1.2
76	Predatory	1.6
80	Triplet	3.0
84	Adjustable	2.4
90	Parallel	3.0
95	Catastrophe	2.6
96	Departing	2.6
106	Portable	2.8
109	Coniferous	2.8
112	Filtration	2.4
114	Tranquil	1.2

[a]No ratings were made beyond BPVS item no. 120. Abstract items were those with a mean score of 3 or below out of 7 on concreteness ratings.

8 most abstract items included 5 emotion-related items (horror, delighted, disagreement, surprise, and tranquil). Two pairs of subjects attempted all 8 abstract items, a further 13 pairs judged 6 or 7 of the items, and 6 pairs judged 5 of the items. A two-way analysis of variance for matched pairs revealed no significant main effects of diagnosis or type of item, nor a significant interaction.

Our second approach was to perform similar calculations with respect to all 21 abstract and associated concrete items. The abstract items included 7 emotion-related items. A two-way analysis of variance for matched pairs revealed no main effects of diagnosis nor type of item, nor a significant interaction.

These initial analyses of scores on all abstract items were performed in order to permit direct comparison with earlier findings, and to avoid the bias that might have been introduced by excluding certain items from consideration. The results have been presented in outline only, because the most informative data concerning performance on abstract items are those that exclude scores on a class of items already identified as special, namely, items with emotional content. These results are given in detail in the following section.

Further Analyses

The following analyses are intended to elucidate subjects' performance on emotion-related, human-related, and abstract items, and to shed light on possible implications for the interpretation of the BPVS. The nonsignificant findings with respect to social-related items were not analyzed further.

Emotion-Related Items

The lack of significant group differences in performance on social vis-à-vis nonsocial items, and abstract vis-à-vis concrete items, strongly suggests that the social and abstract quality of the emotion-related items is not responsible for the difficulty they present to autistic subjects. However, a more direct test of this issue would be desirable. This is not possible with regard to the abstractness of the emotion-related items, for as we have noted, all but one of these items were classified as abstract (the exception was "embracing," which fell into the intermediate abstract category).

With regard to social content, on the other hand, only three of the emotion-related items were also classified as social-related. There were three emotion-related items (horror, delighted, and surprise) which were given zero scores for social content. Since the latter three items were judged by all subjects, a separate analysis was conducted to compare scores on these nonso-

cial emotional items and associated nonemotional items (i.e., taking the mean score over the four nonemotion items which were nearest in level of difficulty to the respective emotion-related item). An inspection of "nonemotion minus emotion" difference scores revealed that for each diagnostic group, these were approximately normally distributed over a range of scores from -3 to $+2$. A two-way analysis of variance for matched pairs revealed no main effect of diagnosis, a main effect of type of item with higher scores on the nonemotion items, $F(1, 20) = 18.63, p < .001$, and a significant interaction of diagnosis by type of item, $F(1, 20) = 6.05, p < .05$. An analysis of simple effects revealed that the superiority of autistic over nonautistic subjects on the nonemotion items was not significant, but autistic subjects scored significantly lower than nonautistic subjects on the emotion items (related $t = 2.78, p < .01$). Only for autistic subjects were scores on the emotion items significantly lower than scores on the nonemotion items (related $t = 4.73$, $p < .0001$).

It would also have been desirable to examine performance on emotion-related nonhuman items. However, there were only two items (snarling and tranquil) that fell into this category, and the most difficult of these was attempted by only two pairs of subjects. Therefore it was not possible to pursue the matter further.

BPVS Plates with Human Content

It has already been observed that there were significant group differences in performance on the 29 items with human content vis-à-vis nonhuman items of comparable difficulty. When the 6 emotion-related items with human content were removed from consideration, however, the interaction of diagnosis by type of item (nonhuman, human) was no longer significant, $F(1, 20) = 3.02, p < .1$. Yet even now there was a trend for autistic subjects to achieve relatively low scores on the items with human content, and in 14 of 21 pairs of subjects, the autistic individual had a higher "nonhuman minus human" difference score than his or her matched nonautistic subject. When social-related items were also excluded from consideration, however, leaving a maximum score of 8 on plates with human content, group differences virtually disappeared: "Nonhuman minus human" difference scores were higher for autistic individuals in 10 pairs of subjects, but higher for nonautistic individuals in 8 pairs of subjects.

Abstract Items

In order to compare subjects on abstract items that were not emotion-related, the 7 emotion-related items were excluded from the 21 abstract items

shown in Table V, and scores on the remaining 14 items were compared with those on corresponding concrete items. The results appear in Table VI. The close comparability between groups, and between abstract and concrete items with respect to level of difficulty, is reflected in the aggregate scores given in Table VI. A two-way analysis of variance for matched pairs revealed no significant main effect of diagnosis nor type of item, and no significant interaction.

BPVS Scores

The one specific group difference that emerged from the results is that between subjects' performance on emotion-related items. An issue that arises is the degree to which this influences subjects' overall BPVS scores.

Nonautistic and autistic subjects had been individually matched on overall BPVS scores, and in this regard there was no significant group difference (related $t = 1.17$, ns). However, nonautistic subjects scored marginally more highly than autistic subjects (Table I). When the 8 emotion-related items were removed from consideration, the two groups were nearly identical in their scores on the remaining BPVS items: Nonautistic subjects' mean score 62.1, *SD* 16.0, autistic subjects' mean score 62.0, *SD* 15.6 (related $t = 0.11$, ns). Even when social-related items were also excluded, the difference between groups was not significant.

DISCUSSION

When autistic and nonautistic subjects individually matched for age and for scores on the BPVS were compared for performance on a subset of the BPVS items—those that were either emotion-related or emotion-unrelated according to judgments by independent raters—there were significant group differences in the predicted direction: Nonautistic subjects scored more highly on emotion-related vis-à-vis nonemotion items than matched autistic subjects. This result was not solely attributable to the social content of the items, indeed the group difference was significant when only nonsocial emotional items were considered. Nonautistic subjects also scored more highly than autistic subjects when they judged BPVS plates featuring human beings vis-à-vis those with nonhuman content. However, this difference remained only as a nonsignificant trend when emotion-related items were removed from consideration. The two groups were not significantly different in their scores on highly abstract items. In fact, there was little evidence that the subjects of either group found abstract items more difficult than nonabstract items.

It should be noted that in the present study, we made no attempt to differentiate subjects' comprehension of words from their understanding of

Table VI. Performance of Matched Pairs of Subjects on Abstract Items which were not Emotion-Related and Matched Nonabstract (Concrete) Items

Subject pair[a]	No. of Ab items attempted	Autistic (A)			Nonautistic (NA)			
		NAb[b]	Ab[c]	NAb − Ab d(A)	NAb[b]	Ab[c]	NAb − Ab d(NA)	d(A) − d(NA)
1	14	10.0	10.0	0.0	10.5	11.0	−0.5	+0.5
2	14	8.5	14.0	−5.5	10.0	9.0	+1.0	−6.5
3	12	8.0	11.0	−3.0	9.0	8.0	+1.0	−4.0
4	13	10.5	9.0	+1.5	9.5	10.0	−0.5	+2.0
5	11	7.0	7.0	0.0	9.0	9.0	0.0	0.0
6	9	5.5	7.0	−1.5	6.5	8.0	−1.5	0.0
7	9	6.0	7.0	−1.0	6.5	5.0	+1.5	−2.5
8	8	5.5	6.0	−0.5	6.0	5.0	+1.0	−1.5
9	8	5.5	7.0	−1.5	5.5	5.0	+0.5	−2.0
10	6	4.5	4.0	+0.5	5.0	6.0	−1.0	+1.5
11	5	4.0	5.0	−1.0	4.5	4.0	+0.5	−1.5
12	5	4.0	5.0	−1.0	4.0	4.0	0.0	−1.0
13	4	4.0	4.0	0.0	3.5	4.0	−0.5	+0.5
14	5	4.5	4.0	+0.5	4.0	4.0	0.0	+0.5
15	6	5.0	4.0	+1.0	4.5	5.0	−0.5	+1.5
16	5	3.5	2.0	+1.5	4.0	5.0	−1.0	+2.5
17	4	3.0	4.0	−1.0	3.5	3.0	+0.5	−1.5
18	4	3.0	4.0	−1.0	4.0	4.0	0.0	−1.0
19	4	3.0	3.0	0.0	3.5	3.0	+0.5	−0.5
20	4	3.5	2.0	+1.5	4.0	3.0	+1.0	+0.5
21	4	3.5	3.0	+0.5	3.0	2.0	+1.0	−0.5
	Aggregate:	112.00	122.00		120.00	117.00		

[a]Subject pairs are ordered in terms of BPVS score (pair 1 with highest scores, pair 21 with lowest).
[b]Nonabstract items (i.e., score 5 to 7 on concreteness ratings). NAb scores were calculated as mean scores (see text) so that not all are integers.
[c]Abstract items which were not emotion-related (i.e., score 0 to 3 on concreteness ratings, and less than 1 for emotional content).

pictures. The pictures of the BPVS cannot be judged unless one knows what is *in* the pictures to be judged, and the relevant concepts are provided by the words. It requires complementary methodologies such as those of Tager-Flusberg (1985a, 1985b) to determine whether the present results are borne out when meaningful words and pictures are presented separately.

At the time the BPVS was administered to the subjects, we had no intention of conducting a study such as this. We were investigating emotion recognition in autism, and therefore noted with disquiet the emotional content of certain of the BPVS items. Our prime focus was on the potential contrasts between BPVS-matched autistic and nonautistic subjects in their performance on tests of emotion and nonemotion object recognition. It was only when we came to consider the results from the latter tests in relation to subjects' BPVS scores that we decided to investigate whether the BPVS was itself partly a test of emotional understanding. In a sense, therefore, we conducted the present study whilst blind to its purpose—a most unusual circumstance when conducting experiments with autistic individuals. In the event, evidence has emerged that autistic subjects are specifically impaired on those items of the BPVS that independent judges consider to have high emotional content. It is worth stressing that the concepts represented by the emotion-related items of the BPVS are far less circumscribed than those examined in most studies of emotion recognition. In particular, only a few of the items concern primary emotions and their bodily expressions. This was essential to the purpose of our study, for we wished to sample the broader scope of concepts for which affective understanding might have particular importance.

A further significant difference between the groups was that which concerned BPVS plates featuring human beings. The small number of emotion-related items were disproportionately important for this result. When social-related as well as emotion-related items were excluded, there was little evidence that the remaining BPVS plates with human content were more problematic for autistic subjects. There was also some suggestive evidence that compared with autistic subjects, nonautistic subjects might have found social items less difficult than nonsocial items. It is possible to speculate why less emphatically emotion-related items concerning people might present difficulties for autistic subjects; for example, there might be relatively nonemotional aspects of the bodily appearances or social characteristics of people to which autistic individuals are insensitive (e.g., Hobson, 1983, 1987; Baron-Cohen, Leslie, & Frith, 1986). The range of emotion-related concepts might also extend further than appears at first glance (Table II provides an indication of this). Or again, as Shipe et al. (1966) have observed, individuals who do not fully participate in interpersonal relations may have less opportunity for acquiring human-related concepts of various kinds. This is a matter that deserves further study.

The final result to consider is that concerning the performance of subjects on abstract vis-à-vis concrete items of the BPVS. The scores of autistic and nonautistic retarded subjects were similar on each kind of item. Overall, abstract items were no more difficult than concrete items occurring around the same points in the BPVS scale. It requires study of the profiles of performance of a group of BPVS-matched normal children to confirm that this pattern of results is not atypical. The design of the BPVS according to increasing difficulty of items suggests that for normal subjects too, matched abstract and concrete items would be equally difficult. Assuming this to be so, there are two approaches to interpreting the results. The first is to consider whether the content and format of the BPVS is adequate to appraise specific disabilities in the capacity to abstract. If in some nonspecific way, the pictures for abstract words could be discriminated more easily than those for concrete words, the test might not be a good measure of abstracting ability per se. This is certainly possible, but the significant findings with respect to emotion-related vis-à-vis nonemotion items cast some doubt on the matter. The second approach is to suppose that when tested by the procedures of the BPVS, and when matched for overall BPVS scores, neither autistic nor nonautistic retarded individuals are abnormal in their ability to comprehend abstract concepts per se. This is in keeping with the findings reported by Tager-Flusberg (1985a, 1985b), insofar as her own equivocal results with the nonautistic mentally retarded might have been related to their low IQ.

Several qualifications are in order, however. First, the subjects who took part in our study were relatively able, and had already acquired considerable verbal facility. We selected subjects who not only had sufficient abstracting capacity to learn the meanings of words but also had acquired sufficient language to augment their abstracting capacity (this sentence is not tautologous). It is quite possible that when language is developed beyond a certain level in more able autistic and perhaps nonautistic individuals, there occurs a shift to a qualitatively different profile of abilities and disabilities (see, for example, Hermelin & O'Connor, 1970; Prior, 1977; Tymchuk, Simmons, & Neafsey, 1977). Second, the findings have no bearing on how much the development of such linguistic and abstracting abilities is delayed in autistic and nonautistic retarded children, only upon the nature and range of such ability as has developed by the time higher levels of performance have been achieved. Third, and obviously, these considerations are not applicable to all abstract words, in that certain kinds of abstract concepts may present special problems. Finally, even able subjects might manifest deficits in abstracting ability on other tasks or in other interpersonal settings. As some authors have argued (e.g., Hobson, 1989; Scheerer et al., 1945), it may be the source and quality (as much as the degree) of autistic individuals' impairments in abstracting ability that will prove to be unique to autism. Nonau-

tistic retarded subjects' abstracting abilities and disabilities also deserve further investigation.

What implications do the present findings have for matching autistic and nonautistic retarded subjects according to the BPVS? Perhaps there are more implications for our ideas about what the BPVS measures than for the decision whether or not to employ the test as a matching procedure. At least when emotion-related items are defined according to rather narrow criteria, they appear to make only a modest contribution to the matching of subjects who have the range of age and intelligence recorded in the present study. On the other hand, there is reason to suppose that whilst such items are the most strongly emotion-related, they may not be the only items for which emotional considerations are important. With regard to the present study, for example, judges were specifically instructed to rate most BPVS items as zero for emotional content. Or adopting a broader perspective, affective understanding might have relevance for the way an individual comes to acquire concepts and to learn words of many kinds (Hobson, 1989). If this is so, the contribution of affective impairments to autistic individuals' poor performance on the BPVS may extend beyond their responses to items with specifically emotional content. Whatever the case in this regard, the present findings may have special relevance for studies of emotion recognition that have employed the BPVS to match autistic and nonautistic subjects (e.g., Hobson et al., 1988a, 1988b; Jennings, 1973). If to some extent, subjects have been matched according to their degree of emotion-related understanding, such studies are likely to have yielded results that underestimate group differences in performance on subsequent tests within the very same domain of psychological function.

With regard to interpreting the BPVS, it is now evident that to consider this as a test of receptive language ability is overly simplistic. Clearly the items of the BPVS differ in manifold ways, not least in the degree of emotional content, social content, and abstractness. There are probably other areas of meaning not represented or not yet investigated in the BPVS, concerning which autistic individuals have specific difficulty. We may be well advised to think in terms of composite BPVS abilities, and to recognize how little we know of what this set of abilities comprises. Yet the BPVS will continue to be of value as a test that can be employed to establish comparison groups of autistic and nonautistic subjects. Such groups may then be compared on specifically designed index and control tasks. The lesson to be learned is that we should exercise caution in using the BPVS as a benchmark for interpreting whether any group differences or group similarities which emerge are or are not a function of supposed verbal ability.

The BPVS was not designed as a test of children's understanding of emotion. In many respects, it is ill-suited for such a purpose: There are few

emotion-related items, and the majority of these involve stylized drawings that are less than evocative. It has already been observed that "correct" responses on the items may imply only partial understanding of what the items mean, perhaps especially when highly schematic drawings accompany emotion-related or otherwise abstract words. Thus although it is important to note that autistic subjects made numerous correct responses to emotion-related items of the BPVS—most had clearly learned something about what such words and pictures meant—there remains doubt about the breadth and depth of their concepts in this and in other respects. These very drawbacks may have been turned to advantage, however, in that evidence from the BPVS has borne out a seemingly inauspicious prediction based on independent kinds of evidence for emotion recognition deficits in autism. When compared with matched nonautistic retarded subjects, autistic individuals were specifically impaired in choosing those BPVS pictures that corresponded to emotion-related rather than emotion-unrelated words.

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