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13 Attention to Social Stimuli and Communication in Children with Autism Spectrum Disorder

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I. Introduction

Persons with autism spectrum disorder (ASD) are diagnosed by DSM-IV-TR (APA, 2000) in the following three criteria: (1) Qualitative impairment in social interaction: lack of non-verbal communication such as eye contact and joint attention. (2) Qualitative impairments in communication: delay of and lack in the development of spoken language. (3) Repetitive and stereotyped patterns of behavior, restricted interests, and activities.

In general, children with ASD have deficits and weakness in social development. As for perception, they have difficulties in appropriately responding to ambiguous visual (e.g., other's eyes, face, mouth and biological motion), auditory (e.g., prosody, human voice), and tactile (e.g., novel and sudden stimulation) stimuli.

Studies of cognitive development in typically developing children have shown that they looked at the stimuli as global and integrated one though the children with ASD attended to the local and separated elements of the stimulus (Happe & Frith, 2006). They also often cannot attend to the relationship of the stimuli, but to the parts of the relation. This tendency leads to the difficulties in comprehending the social relationships in which the global attention to the social stimuli is required.

The children with ASD tend to stick to the detailed parts of the stimuli so that they cannot extract the essential part of the stimuli. They have difficulties in switching their attentions to various components and overall perspectives of social

context. As a result, their reports, descriptions and explanations do not often come across to the other person.

These tendencies have been named as "weak central coherence: WCC". According to Happe and Frith (2006), the WCC has often been evaluated by using tasks with geometric figures. There are few experimental studies manipulating stimulus dimension for evaluating central coherence using stimuli of everyday life behavior in the social context (Mundy, Sigman, Ungerer, & Sherman, 1986).

A lot of studies of applied behavior analysis have shown that children with ASD have deficits in cognitive and linguistic function. With respect to attention, they often attend to the specific elements of stimulus, not to all elements of the stimulus. Also, they often cannot allocate their attention to multiple elements of the stimulus. This phenomena has been named as "stimulus overselectivity (Lovaas, Koegel, & Shreibman, 1979)." This would be the cause of deficits of contextual and relational stimulus control in children with ASD.

Children with ASD also have deficits in linguistic function. Recent studies found that they can acquire imperative function, but have difficulty in acquiring declarative function. These functions correspond to "mand" and "tact" by Skinner (1957). Skinner (1957) defined mand as a "verbal operant in which the response is reinforced by a characteristic consequence and is therefore under the functional control of relevant conditions of deprivation or aversive stimulation (pp.35–36)." Tact was defined as "a verbal operant in which a response of given form is evoked (or at least strengthened) by a particular object or event or property of an object or event (pp.81–82)."

The deficits of declarative function may lead to the difficulty in informing the message to the other person (listener), sharing it and making the reciprocal communication (Tager-Flusberg, Paul, & Lord, 2005). However, few studies have been conducted to examine the stimulus control of the child's attention and linguistic function to social stimuli (Partington, Sundberg, Newhouse, & Spengler, 1994).

In the current study, we control components of social stimulus and evaluated multiple dependent variables to clarify the characteristics of the contextual and relational stimulus control in children with ASD.

II. Study 1

1. Purpose

One of the aspects of autistic disorders is the deficit in verbal communication (DSM-IV; APA, 2000). The characteristics of verbal communication in individuals

with ASD have been analyzed in many studies. It is said that their inappropriate uses of language in social situations are the most prominent aspect of communicative deficit in individuals with autism (Tager-Flusberg, Paul, & Lord, 2005). There are several characteristics in their communications, productions of irrelevant detail, provisions of insufficient background information, and so on.

The purpose of our first study (Study 1) was to evaluate the attention and linguistic function in children with ASD by using pictures and animation films, and the results were compared with typically developing children.

2. Method

2.1. Participants

Seven children with ASD aged six to nine (5 males and 2 females) and seven typically developing children (TYP) aged six to eight (5 males and 2 females) participated in the present study. Participants were in two groups, ASD and TYP. The mean age of language development of each group was seven years old.

2.2. Setting and Materials

Two pictures which depicted everyday-life scenes and two animation films which depicted annoying situation (Nipponn Hoso Kyokai, 2006) were used as stimuli. One picture depicted a scene that children were playing in a park and another picture depicted a scene that children playing in a kindergarten. One animation film showed a story that a boy wanted to urinate during the class because he didn't go to the toilet during the break, and another film showed that a boy returned a comic book to his friend but the friend got angry for the comic was ragged.

2.3. Procedure

The experimenter was sitting and facing to the participant and asked, either "Please talk about this picture. If you finish talking, please tell me that," showing one of the pictures on the PC monitor, or "Please talk about the story you've watched," after showing the animation film. All utterances of participants for describing the pictures and films were recorded with a video camcorder. The order of presenting stimulus was counterbalanced among participants.

2.4. Dependent Measures and Experimental Design

The children's verbal description was evaluated from the following three aspects; the numbers of keywords, the numbers of segments, and the intelligibility of description. Keywords and segments were selected by preparatory assessment in

which we asked five typically developing adults to make a list of words they think necessary for explain the pictures and the films. The numbers of keywords and segments which were involved in children's description were counted.

As to intelligibility of description, we asked five typically developing adults to assign the score of 1 to 5 points of the intelligibility of the children's description for the stimulus (picture and animation) on Likert scale, while listening to child's talk about the presented stimulus. The examples of items of the scale used were as follows: the child's description is generally understandable; the usage of words is appropriate; there are relatively many irrelevant descriptions (reversed item).

The groups-comparison design was used for both ASD and TYP.

3. Result and Discussion

Figure 1 shows the mean numbers of keywords of children's description in each group and stimulus. In Figure 2, the mean numbers of segments in each group are shown. Figure 3 shows the mean scores of the intelligibility of the description. There were no significant differences between ASD and TYP group in the numbers of keywords and segments. There were significant differences between two groups in the mean score of the intelligibility of the description in both stimulus types, pictures and films ($t=3.20$ (12), $p>.01$; $t=2.32$ (12), $p>.05$), the mean scores in ASD group were lower than those of TYP group.

The purpose of Study 1 was to evaluate the characteristics of attention and verbal description to pictures and animation films in children with ASD by comparing with typically developing children. The result showed that children with ASD could make statements which included as many keywords and segments as typically developing children, but their statement had less capability of coming across than typically developing children. The result suggested that the difficulty of verbal description in children with ASD would be caused rather by the aspect of functionality of communication than that of formality.

III. Study 2

1. Purpose

When we inform the other person of something, we need to mention the relation of things in a priority basis. The result of Study 1 showed that the children with ASD could attend to as many keywords and key segments as typically developing children when simple picture and video were used. However, there were signifi-

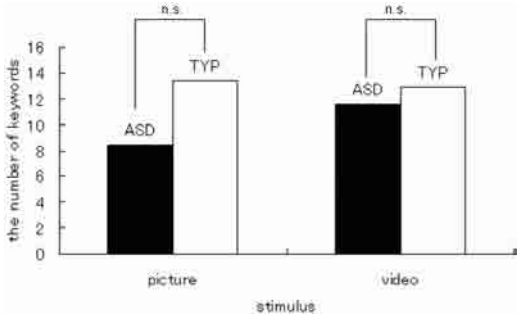

Figure 1. Numbers of keywords in picture and animation conditions for children with ASD and typically developing children.

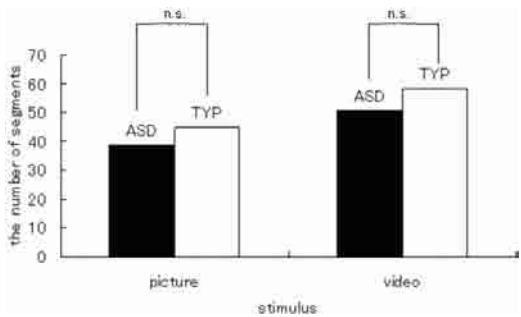

Figure 2. Numbers of segments in picture and animation conditions for children with ASD and typically developing children.

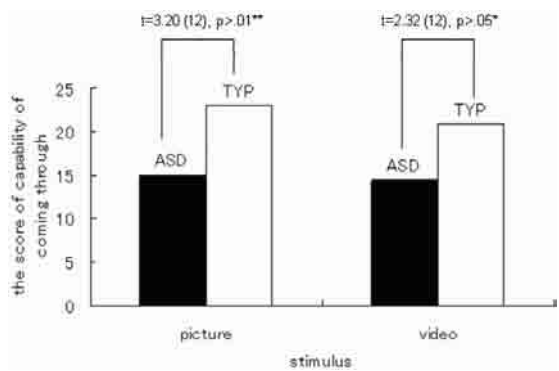

Figure 3. Scores of intelligibility in picture and animation conditions for children with ASD and typically developing children.

cant decrease in intelligibility of verbal description, and they could not often come across to the listener what the child looked at and described.

The purpose of Study 2 was to examine whether children with ASD could attend to and describe the significant and social aspect of more complicated social stimulus, by comparing with non-ASD children and typically developing children (Happe, Booth, Charlton, & Hughes, 2006).

2. Method

2.1. Participants

Participants in this study were 15 children with ASD aged five to eleven (10 males and 5 females), 3 children with attention deficits/hyperactive disorder (ADHD) aged five to nine (2 males and 1 female), and 10 typically developing children aged six to eight. We constructed three groups, ASD, Non-ASD, and TYP. The mean language developmental age of each group was seven years old.

2.2. Setting and Materials

A picture which depicted several persons and things at a train station was used as the stimulus. It depicted some points of scene focusing on social context. The points were determined by asking 10 typically developing adults showing the picture, "please pick five points that you think important," and most frequently selected five items were considered as correct answers. The picture is shown in Figure 4.

2.3. Procedure

The experimenter was sitting and facing to the child showing the picture, then asked, "Here is a picture depicts several persons and things. What are the important parts in this picture? Please show me five parts that you think they are important." All statements of the participants were recorded and the numbers of answers were counted down like, (i.e., "O. K., four more"), until the child mentioned the fifth part.

2.4. Dependent Measures and Experimental Design

The children's verbal utterances to the stimuli in the picture were scored by counting the number of correct answer they mentioned. We scored 2 points for correct answers, 1 point for answers which were not enough for describing the events or involved too much interpretation, and 0 point when the child mentioned another event. The correct answers and scoring basis are shown in Figure 5.

The group-comparison design was used for all ASD, TYP, and Non-ASD groups.

Figure 4. The picture used in Study 2.

No.	The correct answer and the criterion for each rating value	
1		**2 points**: A participant mentions that a boy gives up his seat for an elderly woman. **1 point**: A participant mentioned that an elderly woman next to a boy doesn't give up her seat while she is standing.
2		**2 points**: A participant mentions that a girl is standing outside of the white line and it's dangerous. **1 point**: A participant only mentions that a girl is not smart because she is standing at the dangerous spot.
3		**2 points**: A participant mentions that there is a wallet dropped on the ground. **1 point**: A participant mentions as if the dropped wallet belongs to the man.
4		**2 points**: A participant mentions that a boy is crying. **1 point**: A participant mentions the reason of the boy's cry is that he has been kicked around by the child standing by him
5		**2 points**: A participant mentions that children are playing at the stepway and discommode people around them. **1 point**: A participant only mentions that children are talking to each other while moving down the stepway.

Figure 5. Points assigned to the child's verbal response.

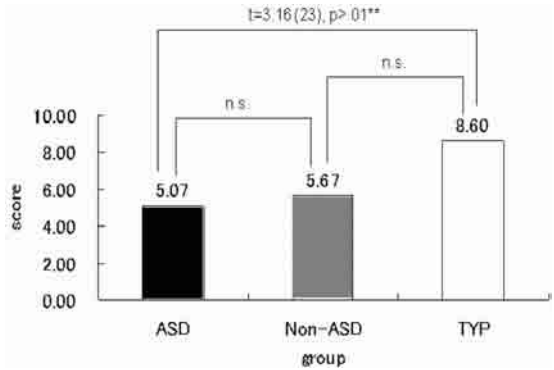

Figure 6. The mean scores of each group in Study 2.

3. Result and Discussion

The mean scores of each group are shown in Figure 6. The mean score of ASD group was 5.07, non-ASD group was 5.67, and TYP group was 8.60. The score of ASD group was significantly lower than TYP group (t=3.16 (23), p>.01). There was no significance between TYP group and ASD group and Non-ASD group.

The purpose of Study 2 was to examine whether the children with ASD could pick out the essential and relational part of complicated stimulus, comparing with Non-ASD or typically developing children. The results showed that the scores of attending important parts was lower in ASD group than TYP group, and there was no significant difference between TYP group and ASD group or Non-ASD group, and between ASD group and Non-ASD group. The data reflected their difficulty in attention and description of social stimuli.

IV. General Discussion

In Study 1, the resuts showed that although the children with ASD could attend to and express the multiple components as in the typical children, they have difficulty in coming across the total context of the event to another person, a listener. In Study 2, the resuts showed that they have difficulty in attending and expressing the relational and social parts of the stimuli: they often just attend the elements itself.

Results from the current studies indicate that a future study would be needed to examine the developmental change of their tendency and clarify the plasticity of its tendency.

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