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# 39

## Development of Teaching Behavior in Typically Developing Children and Children with Autism

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### Introduction

Teaching is a universal behavior for humans. The fact that various school and education systems exist world wide is a representative example.

In addition, teaching is an important behavior. Chimpanzees, called ‘evolutionary neighbors to humans,’ can’t teach others (Hirata & Celli, 2003). So, the study of teaching behavior can reveal human psychological characteristics, especially relating to human social development.

Teaching also has a close relation to the understanding of another’s mind (e.g., theory of mind) Individuals cannot teach others without an understanding of other’s mental state.

This chapter reviews studies about the development of teaching behavior. Then I summarize my three studies on primitive teaching behavior, called active teaching (Akagi, 2004; Akagi, 2008; Akagi & Nakajima, 2007) .

### Development of teaching behavior

A comprehensive definition of teaching is elusive and difficult, as Strauss, Ziv, & Stein (2002) pointed out. However, the teaching behavior is generally defined as an intentional activity to increase the knowledge, skills and

norm of others (Ziv & Frye, 2004; Kinoshita & Kubo, 2010).

There are few studies on the early development of teaching. Most of these studies examined the relation between teaching behavior and theory of mind in preschool children (Strauss, Ziv, & Stein, 2002; Ziv & Frye, 2004; Davis-Unger, & Carlson, 2008).

For example, Davis-Unger & Carlson (2008) studied children's strategies for teaching. After the experimenter taught the child the rules of a board game, the child was asked to teach the rules to another child. The results showed that 4- and 5-year-olds exhibited more various teaching strategies than 3-year-olds.

Taking another approach, Ziv & Frye (2004) investigated preschool children's understanding of teaching behavior. The results showed that 3- and 4-year-old children could understand the meaning of teaching which is that the person who had more knowledge could be a teacher. The children could understand that teaching behavior depended not on the role of the teacher, but on the condition of understanding knowledge. In addition, it has been reported that 2- and 3-year-old children could teach others (Ashley & Tomasello, 1998).

The origin of teaching behavior in younger children has not been sufficiently studied. Nor are there studies of the development of teaching behavior in children with disorders. There are the areas that my research focused on: primitive teaching behavior in very young children, and children with autism.

## **The developmental origin: active teaching**

Teaching behavior has its origin in active teaching, which is defined as directly correcting the erroneous actions of others (Boesch, 1991). Active teaching in human children has not been studied yet. I first investigated on the occurrence of active teaching in 1-year-old children (Akagi, 2004). I studied children 12 to 23 months old because 18 months of age is when children begin to recognize the psychological self-other differentiation and are able to infer the goal of an action. In order to be able to teach, the child needs to be able to recognize the error behavior of others, which also emerges from 18 months of age (Meltzoff, 1995).



Figure1 Hameita

Akagi (2004) used the mathematical shape task from the Kyoto Scale of Psychological Development, where the child is to place a square, round or triangular shaped object through the corresponding shaped hole (Hameita task, see Figure 1). Participants were the 42 typically developing children, aged 12 to 23 months old. The experiment was conducted at their nursery school. The children were divided into three age-groups. Group I was 12 to 15 months old (7 children), Group II was 16 to 19 months old (16 children), Group III was 20 to 23 months old (19 children). The experimenter sat face to face with the participant, and the experimenter played together for several minutes until the child was comfortable. Then, the child saw the experimenter try to put the round disk into the square hole. Then the experimenter said “Oh! I can’t.” during the task.

All these sessions were videotaped, and analyzed. The behaviors of the children were divided into the following four categories; (1) Putting; The child tried to put the round disk into the round hole (or the square hole). (2) Pointing; The child pointed to the round hole. (3) Staring; The child did nothing except stare at the experimenter. (4) No interest; The child did not take an interest in the experimenter’s action and did not look to the experimenter.

As shown in Figure2, all the 12- to 15-month-old children tried to put the round disk into the round hole. About 80 % of the 16- to 19- month-old children also tried to this same behavior. In contrast, 60% of 20- to 23-month-old children pointed to the round hole.

In addition, Table1 shows, all the children who pointed to the round hole

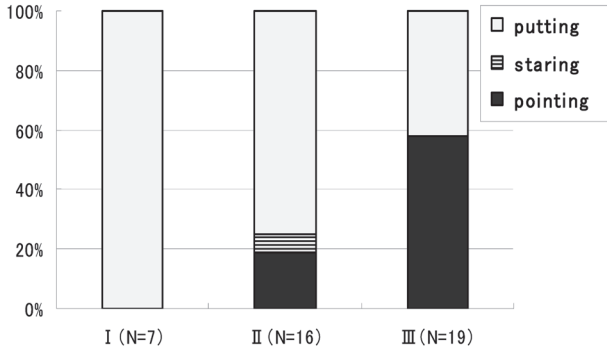


Figure2 The behaviors of the typically developing children when looking to the experimenter's action

Table1 Analysis of communication means when typically developing children act towards the experimenter or the round disk.

	Only action to the experimenter or <i>Hameita</i>	In addition to action to the experimenter or <i>Hameita</i> , the other means of communication		
		looking to the experimenter	vocalization or utterance	Eye contact + vocalization (or utterance)
Pointing to the round hole (N=14)	0	2	8	4
Non pointing (N=29)	18	9	2	0

also engaged in an utterance or some communication with pointing. On the other hand, only 40% of the no pointing children did not have any communication means.

These results suggest that the children who pointed to the round hole also intended to attract the attention of the experimenter to their action. Thus, this would be considered to exemplify active teaching, which seems to emerge at about 20 months of age.

## Active teaching in children with autism

Autism spectrum disorder is a disorder which affects the following three areas. The first area is qualitative impairment in social interaction; Difficulty maintaining eye-to-eye contact, facial expression, social or emotional reciprocity and so on. The second area is qualitative impairments in communication; Problems with spoken language, echolalia and so on. The last area is restricted repetitive and stereotyped patterns of behavior; Specific, nonfunctional routines or rituals and so on.

The core symptoms of autism involve an impairment of social communication (Bowler, 2006). Children with autism have various problems in areas of social communication. They show impairment of joint attention, social referencing, theory of mind, understanding metaphor and so on.

There are no studies on the development of teaching behavior in individuals with autism. Investigating teaching behavior in children with autism may reveal information about social development.

Active teaching in children with autism was investigated (Akagi & Nakajima, 2007). 36 (male=27, female=9) children with autism participated this task. This task was conducted at the hospital that they regularly frequented. They had all received a diagnosis of autism according to DSM-IV-TR. Their developmental age was assessed by the Kyoto Scale of Psychological Development. They were divided into two groups based upon developmental age: mild mental retardation group and severe mental retardation group. Their characteristics are shown in Table2.

The same task and procedure was used as with typically developing children in Akagi (2004). The results reported in Akagi & Nakajima (2007) show that only about 20% of the children of the severe mental retardation group pointed to the round hole and another about 20% of them had no interest in the experimenter's action (see Figure3). In the group of the moderate mental retardation group, about half of the children pointed to the round hole.

Almost all the children with autism who pointed to the round hole also displayed some communication means while pointing, which is similar to the results for the typically developing children (see Table3).

The results suggest that the children with autism can exhibit active teaching. However, the developmental age of the occurrence of active teaching

Table2 Characteristics of children with autism<sup>a</sup>

		Chrono-logical age	Developmental age <sup>b</sup>			Gender ratio (Males:Females)
			All Area	Cognitive-Adaptive Area	Language-Social Area	
Autism with severe mental retardation (N=18)	M	54.2	22.7	26.1	18.9	15:3
	Range	29-113	13-31	16-38	9-31	
Autism with mild mental retardation (N=18)	M	60.6	40.0	43.1	36.3	12:6
	Range	36-81	34-53	32-58	19-50	

a Age is expressed as months.

b Developmental age was assessed by the Kyoto Scale of Psychological Development.

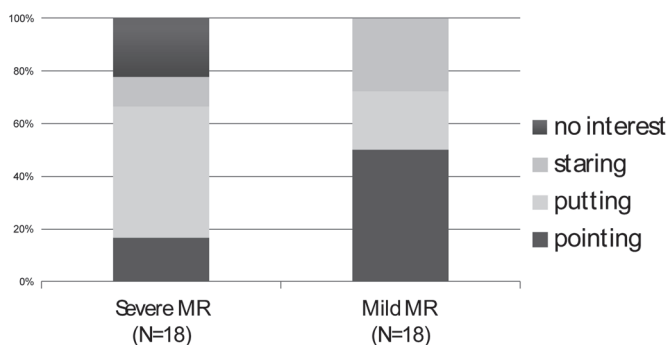


Figure3 The behaviors of the children with autism when looking to the experimenter's action

Table3 Analysis of communication means when children with autism act towards the experimenter or the round disk.

	Only action to the experimenter or <i>Hameita</i>	the other means of communication in addition to action to the experimenter or <i>Hameita</i> ,		
		looking to the experimenter	vocalization or utterance	looking + vocalization (or utterance)
Pointing (N=12)	1	1	7	3
Putting (N=13)	11	1	1	0

was later than that for typically developing children. Typically developing children exhibited active teaching from 20 months. In contrast, the children with autism exhibited the active teaching from about 40 months of developmental age. This difference suggests that the variables other than developmental age might influence the occurrence of active teaching.

### Active teaching in adolescents with autism

Adolescents with autism have more difficulties than preschool and school-age children. On the other hand, the symptom of autism has improved, compared to their preschool period (Seltzer, Krauss, Shattuck, Orsmond, & Lord, 2003). Specifically, social interaction has been improved.

These findings suggest that teaching behavior has possibility to improve. So, I conducted a study on active teaching in adolescents with autism (Akagi, 2008). The task and procedure was the same as used with typically developing children (Akagi, 2004). 49 (male=39, female=10) adolescents with autism participated this task. This task conducted in a room at a community workshop they attended. They had all received a diagnosis of autism according to DSM-IV. Their developmental age was assessed by the Kyoto Scale of Psychological Development. They were divided into three groups based upon developmental age: mild mental retardation group, moderate mental retardation group, and severe mental retardation group. Their detail characteristics are shown in Table4.

Table4 Characteristics of adolescents with autism<sup>a</sup>

		Chrono-logical age	Developmental age <sup>b</sup>	
			Cognitive-Adaptive Area	Language-Social Area
severe mental retardation (N=17)	M	287.9	24.1	18.6
	Range	220-413	12-30	10-37
moderate mental retardation (N=16)	M	296.4	41.8	35.1
	Range	219-384	32-52	21-64
mild mental retardation (N=16)	M	290.4	75.8	52.1
	Range	228-348	52-130	21-89

a Age is expressed as months.

b Developmental age was assessed by the Kyoto Scale of Psychological Development.



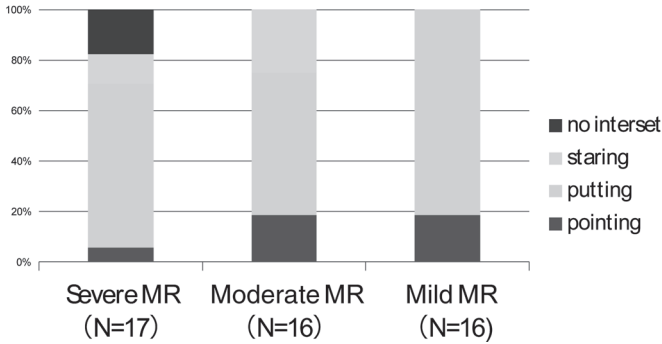


Figure5 The behaviors of the adolescents with autism when looking to the experimenter's action

Table5 Analysis of communication means when adolescents with autism act towards the experimenter or the round disk.

	Only action to the experimenter or <i>Hameita</i>	In addition to action to the experimenter or <i>Hameita</i> , other means of communication		
		looking to the experimenter	vocalization or utterance	Eye contact + vocalization (or utterance)
Pointing to the round hole (N=7)	1	1	4	1

As Figure5 shows, almost all of the autistic adolescents demonstrated by putting the round disk into the round hole, rather than pointing to the round hole. In the group with severe mental retardation, only one adolescent pointed to the circle. In the group with moderate and mild mental retardation, each three adolescents pointed to the round hole.

Almost all the adolescents with autism pointing to the round hole also displayed some communication while pointing similar to the typically developing children (see Table5).

## Discussion

The results about active teaching can be summarized as follows. First, the

typically developing children showed active teaching from about 20 months of age. This result is consistent with recent findings about the social behavior of toddlers. For example, Lizskowski, Carpenter, Striano, & Tomasello (2006) revealed 12- and 18-month-old children showed informative pointing, which directs another person to the location of the object that they are searching for. Toddlers showed prosocial behaviors for another's benefit before using longer.

Second, children with autism could display active teaching, although they manifested this ability at a later age than typically developing children. Recent studies have found that the children with autism can exhibit various social behaviors. For example, Liebal, Colombi, Rogers, Warneken, & Tomasello (2008) found that the children with autism (mean MA of 24 months) can help others as well as developmental delayed children do. Liebal et al. (2008) insisted that the children with autism not only can understand something about other person's goal, but also have the motivation to help the person with that goal. Similarly, the present results about active teaching suggest that children with autism have the ability to understand another person's goal and have motivation to help others.

However, the quality of active teaching in children with autism may not be equal to typically developing children. Some typically developing children showed smiling or clapping of their hands after they pointed to the round hole and the experimenter put the round disk into the round hole. In contrast, the children with autism seldom showed such behaviors. Children with autism might teach from egoism rather than altruism. The children with autism might point to the round hole without any emotional expression because the round disk did not fit the other hole. The affective quality of active teaching is required to be investigated in the future.

Finally, the adolescents with autism showed less teaching behavior than children with autism and typically developing children. It was surprising to find that most adolescents with a higher developmental age did not teach the experimenter. This result was not caused by cognitive factor, because the developmental age of the mild mental retardation group was 75.8 months in the cognitive-adaptive area and 52.1 months in the language-social area. These developmental ages were much higher than those of children with autism. So, the main cause of the lower frequency of active teaching behavior might be their lower motivation to teach the experimenter. It was point-

ed that the adolescents with autism have less motivation to communicate with others (Akagi, 2007). Adolescents might not teach the experimenter by motivational factor rather than cognitive factor.

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