

Effect of Simulation Training on Learning-Related Skills in Elementary School for Children with Autism Spectrum Disorders

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The purpose of this study was to examine procedures helpful to children with autism spectrum disorders in acquiring learning-related skills that would be necessary in elementary school. Three children with ASD participated in this study. Simulation training was conducted in a simulation setting resembling an elementary school classroom. Six learning-related skills were selected as targeted behaviors. For example, their behaviors were “putting up a hand to say something” and “copying in a notebook what the teacher wrote on the whiteboard.” The participants were presented with antecedent stimuli required to perform their targeted behaviors in activities similar to school lessons and recess. As a result, all the participants acquired most targeted behaviors. From this result, the simulation training in this study positively affected the acquisition of learning-related skills.

Key words: autism spectrum disorders, simulation training, learning-related skills, transition support

When children with autism spectrum disorders (ASD) transitioned from kindergarten to elementary school, there are many difficulties (Milsom, 2007; Conn-Powers, Rose-Allen, & Holburn, 1990). Milsom (2007) stated that these difficulties arise from the difference between teachers, learning styles, rules in a classroom, and schedules. In this regard, McClelland, Acock, and Morrison (2006) indicated that acquisition of learning-related skills is a success factor for the transition from kindergarten to elementary school. Previous studies have shown “following instructions,” “participating in group activity,” “self-regulation,” “being punctual” and several other learning-related skills affect the transition to elementary school (McClelland et al., 2006; McClelland, Morrison, & Holmes, 2000; Rimm-Kaufman, Pianta, & Cox, 2000). According to Janus, Lefort, Cameron, and Kopechanski (2007), children are taught daily-living skills in pre-school, but schools usually have curriculum goals to meet and may have to concentrate on treatment directly related to academic outcomes. Therefore, acquisition of learning-related skills is crucial to transfer to elementary school smoothly. However, most studies of transition support to elementary school suggest that teachers read a child’s previous record and receive information about the child from parents; direct support for children with autism spectrum disorders spectrum disorders was minimal (Daley, Munk, & Carlson, 2011). Therefore, procedures to promote acquisition of learning-related skills have not been established.

Ducharme and Ng (2012) taught children with autism

spectrum disorders spectrum disorders to follow instructions in the classroom using errorless learning. In addition, Lloyd, Bateman, Landrum, and Hallahan (1989) used the self-management procedure to teach children with autism spectrum disorders to follow instructions and to hold a pencil in the classroom. As mentioned above, several behavioral interventions have been used to teach learning-related skills and their effectiveness has been shown. However, previous studies have been conducted after children have entered elementary school. To move to elementary school more smoothly, it is more desirable for children with autism spectrum disorders to acquire learning-related skills before entering elementary school. However, if we teach learning-related skills to children with autism spectrum disorders before they enroll in elementary school, we should consider several factors. For example, learning-related skills that children with autism spectrum disorders acquired in the training setting before entering elementary school are not performed if the stimulus used the training setting is not included in the elementary school. On the contrary, in previous studies that taught learning-related skills after children with autism spectrum disorders enrolled in elementary school, a participant’s daily living setting such as special education classroom (Ducharme & Ng, 2012) and pupil’s resource classroom (Lloyd et al., 1989) were provided to them in the training setting. If such setting is not available as children do not enroll elementary school, a procedure that promoted generalization needs to be used to solve a problem of

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generalization.

One of the procedures promoting generalization is simulation training (Bellini, Peters, Benner, & Hopf, 2007). Simulation training is a procedure conducted in settings similar to daily living settings. Previous studies used simulation training to teach how to ask questions (Palmen, Didden, & Arts, 2008), prepare cutlery, make sandwiches (Ayres, Maguire, & McClimon, 2009), and clean sinks and mirrors (Lattimore, Parsons, & Reid, 2008). The participants in these studies showed generalization to daily living settings. This suggests that the use of simulation training may allow children with autism spectrum disorder to demonstrate skills acquired prior to entering primary school after they have entered. However, studies that evaluate the effect of simulation training on learning-related skills are very limited. Proving the effect of the simulation training may be a great help to children with autism spectrum disorders who face difficulty of the transition to elementary school.

Therefore, this study examined the effect of simulation training on the acquisition of learning-related skills that a child would need in elementary school.

Methods

Participants

Three kindergarten-aged boys with autism spectrum disorders participated in this study. All the participants had been diagnosed by an independent psychiatrist. They decided to enroll in local elementary school from the next year. To enroll in this study, participants had to meet the following inclusion criteria: (a) previous diagnosis of an autism spectrum disorders spectrum disorder, (b) to be enrolling in elementary school the following year, and (c) parent and kindergarten teacher both identify the difficulty of transition to a new setting when the child has not yet acquired learning-related skills. The name of the participants in this study are all pseudonyms.

Takuya was a boy aged six years and one month. He could communicate with friends smoothly. In addition, he could play with his friends and, after playing, he could clean up the toys. However, he was not able to follow instructions given by someone. When he was given an instruction, he did not respond enthusiastically. But he was able to sit down continuously. In a new setting, he was restless and fidgety. Takuya never showed behaviors to hurt other in his kindergarten.

Masato was a boy aged five years and eleven months. He could communicate with friends over three turns. In addition, he could see the friend's face during a conversation. However,

he often interrupted others' conversation. In addition, he repeated the same question multiple times. Moreover, he was not able to follow instructions given by someone. When he was given an instruction, he opened and closed his pencil box lid many times. He was unable to start from the first page and instead began from a middle page of the notebook. But he was able to sit down continuously. Masato never showed behaviors to hurt other in his kindergarten.

Hirokazu was a boy aged six years and one month. He could communicate with friends smoothly. In addition, he could talk confidently to his friends. In the new setting, he always looked around in a hurry, regardless of others' instructions. Although he was able to sit down continuously as long as an activity was fun for him, he sometimes left if an activity was not fun. Hirokazu never showed behaviors to hurt other in his kindergarten.

Setting

This study was conducted in a room of an educational institution attached to a university. The size of the room was 5 m by 8 m. A whiteboard, three study desks, and three chairs were located in the room. During this study, the participants sat on their chairs. In addition, some toys were placed in the room. The kind and placement of these materials was made to resemble an elementary school where participants enter. To make this setting, authors saw some elementary school before this study was began.

The study in this setting involved twelve sessions, one session per week, each of which lasted 1.5 hours.

Targeted behaviors

In total, six learning-related skills were selected as targeted behaviors. These behaviors were "taking out a pencil box and a notebook from a bag, and putting a bag on a hook," "putting toys away in accordance with the teacher's instruction," "putting up a hand to say something," "copying in a notebook what the teacher wrote on the whiteboard," "following the teacher's instructions," and "going to the bathroom during recess." Table 1 showed these targeted behaviors, antecedent stimuli, and consequences. To select these targeted behaviors, we have asked parents to answer the questionnaire before this study was started. The questionnaire contained name of twenty targeted behaviors included in Muto, Tsuge, Kaminaga, and Kawamura (2005) and Hashimoto, Watanabe, Hayashi, Kumise, Kudo, Otomo, Yasunaga, and Taguchi (2012). Parents were required to check each targeted behavior that participants can not do well. After all parents finished checking, we decided six behaviors commonly checked by all parents as targeted behaviors.

In "taking out a pencil box and a notebook from a bag,

Table 1 List of antecedent stimulus, response, and consequence stimulus of each targeted behavior

Antecedent stimulus	response	Consequence stimulus
An event that a participant enters a room located in an educational institution.	Taking out a pencil box and a notebook from a bag, and hooking a bag.	A permission of playing from a teacher such as “you can play with toys.”
Information of finishing a recess from a teacher such as “a recess is over.”	Putting toys away in accordance with teacher’s instruction.	A recess was gone. Praise descriptively by a teacher.
Questions by a teacher.	Putting up a hand to say something.	Being Called on by a teacher. (However, a teacher often called on other participants.)
Characters that have been written on the whiteboard.	Copying in notebook what teacher wrote on the whiteboard.	Adding new characters to a notebook. Praise descriptively by a teacher.
The instruction from a teacher.	Following teacher’s instructions.	The progress of a handicraft work Praise descriptively by a teacher.
Starting a recess.	Going to the bathroom at recess.	Taking a pee in the bathroom.

and putting a bag on a hook,” trainers recorded a correct response when the participants took out a pencil box and a notebook from a bag, and put a bag on a hook right after entering the room. In “putting toys away in accordance with the teacher’s instruction,” trainers recorded a correct response if the participant immediately tidied away the toys when the teacher informed the participants that recess was over. In “putting up a hand to say something,” trainers recorded a correct response when the participant raised his hand when given an opportunity to speak by the teacher, for example, when the teacher asked “what time is it?” In “copying in a notebook what the teacher wrote on the whiteboard,” trainers recorded a correct response if the participant wrote in the notebook the same thing that was written on the whiteboard by teacher. In “following the teacher’s instructions,” trainers recorded a correct response if the participant followed the teacher’s instructions such as “get out a paste” and “submit an assignment.” In “going to the bathroom during recess,” trainers recorded a correct response if the participant spontaneously went to the bathroom during recess.

Procedure

General procedure

General procedures occurred during all sessions (i.e., baseline, training, and prove sessions). Each session comprised a “first recess,” an “opening gathering,” a “first lesson,” a “second recess,” a “second lesson,” a “third recess,” and a “final gathering.” Time in one session was about 2

hours. In all sessions, a teacher presented antecedent stimuli and consequences of targeted behaviors to the participants and he basically stood facing the participants in all sessions. In addition, three prompters participated in this study. One prompter was in charge of one participant. A teacher and two prompters were graduate students of Special Education. One prompter was an undergraduate student of Psychology.

The “first recess” began when the participants entered the room. At the beginning of the first recess, the trainers measured whether each participant performed “taking out a pencil box and a notebook from a bag, and putting a bag on a hook.” After they showed this targeted behavior, the trainer allowed them to play with toys. The first recess lasted 10 minutes. On being informed by the teacher that the recess was over, the trainers measured whether each participant performed “putting toys away in accordance with the teacher’s instruction.”

“Opening gathering” began when the participants sat on the chairs after the first recess. In opening gathering, the teacher elaborated upon the lessons of that session. However, the teacher never provided instructions about targeted behaviors.

“First lesson” began right after opening gathering. In the first lesson, two activities were carried out. In sessions 1, 3, 5, 7, 9, and 11, the teacher presented a part of an illustration and asked the participants to name a thing in the illustration. If the participants tried to answer, the trainers measured whether each participant performed “putting up a hand to say

something.” Moreover, if a participant named a thing correctly, the teacher wrote the name of the thing in an illustration on the whiteboard and asked the participants to copy it in their notebooks. Right at this moment, the trainers measured whether each participant performed “copying in a notebook what the teacher wrote on the whiteboard.” In sessions 2, 4, 6, 8, 10, and 12, the teacher asked the participants to say something about themselves (e.g., a favorite food, a favorite toy, and a favorite place) in front of everyone. When the participant described himself, the teacher wrote what he had said on the whiteboard and asked the participants to copy it in their notebooks, and the trainers measured whether each participant performed “copying in a notebook what the teacher wrote on the whiteboard.”

The “second recess” began right after the first lesson. The procedure for the second recess was the same as the first recess, except that it was not necessary for the participants to perform “taking out a pencil box and a notebook from a bag, and putting a bag on a hook.” In addition, the trainers measured whether each participant performed “going to the bathroom during the recess.”

“Second lesson” began right after the second recess. In the second lesson, the handicraft activity was carried out. The participants were required to cut out a picture and to paste a picture onto paper. For example, in session 6, the participants cut out a picture of a hina doll and pasted it onto paper on which a pedestal was drawn. During the second lesson, the teacher explained the method of making art works one by one. The trainers measured whether each participant performed “following the teacher’s instructions.”

The “third recess” began right after the second lesson. The procedure for the third recess was the same as the second recess.

“Final gathering” began right after the third recess was finished. In final gathering, the participants were required to

share their thoughts about this session. After all the participants had spoken, the teacher informed the participants about the time and date of the next session.

Through all activities, if participants showed behaviors to hurt others, the trainer immediately took the participant the corner of the room to protect others. After that, if the participant had been quiet for one minute, the trainer promoted to participate an activity again. Introducing such procedure was gained permission from parents of participants in advance. However, this procedure did not introduce in this study.

In this study, a trial was set to from presentation of an antecedent stimulus to presentation of a consequent stimulus. The number of trials per session varied according to targeted behaviors. Moreover, in “putting up a hand to say something” and “following the teacher’s instructions,” the number of trials differed by session depending on the content of the lesson. Table 2 showed the number of trials per sessions.

Baseline

In the first session of the baseline, the prompter told the participant what they should perform as a targeted behavior before a teacher presented antecedent stimulus. For example, the prompter told the participant “please go to the bathroom” just before the recess was began. This was to judge whether participants didn’t know what to do in this setting or participants didn’t acquire each targeted behavior, if participants didn’t perform targeted behaviors. Prompters never provided prompts and feedback regardless of the response of the participants. However, when the participant tried to injure another participant, the prompter stopped the behavior.

Training

During the training, the prompter praised descriptively the participants when they performed targeted behaviors appropriately (e.g. “good, you have your hand raised”). If the

Table 2 The number of trials per sessions of each targeted behavior

	1	2	3	4	5	6	7	8	9	10	11	12	13
Taking out a pencil box and a notebook from a bag, and hooking a bag	1	1	1	1	1	1	1	1	1	1	1	1	1
Putting toys away in accordance with teacher’s instruction	2	2	2	2	2	2	2	2	2	2	2	2	2
Putting up a hand to say something	4	4	6	4	8	4	6	4	8	8	6	8	13
Copying in notebook what teacher wrote on the whiteboard	6	6	6	6	6	6	6	6	6	6	6	6	8
Following teacher’s instructions	9	8	9	9	12	9	6	9	9	9	8	9	7
Going to the bathroom at recess	2	2	2	2	2	2	2	2	2	2	2	2	1

participants performed a targeted behavior inappropriately, the prompters introduced least-most prompt. Basically, the prompter provided participants to prompts in order of verbal prompt, pointing prompt, partial physical prompt, and manual guidance. If the participants did not perform a targeted behavior five seconds, a prompter provided one higher level prompt. The way to provide prompts to each targeted behavior was as follows.

In “taking out a pencil box and a notebook from a bag, and hooking a bag,” as a verbal prompt, a prompter told a participant “please take out a pencil box and a notebook from a bag, when that is over, hook a bag.” As a pointing prompt, a prompter pointed at a participant’s bag and a hook. As a partial physical prompt, a prompter took a participant’s hand and promoted putting his hand in his bag. As a manual guidance, a prompter took a participant’s hand and promoted taking a pencil box out in his bag, and promoted hooking his bag.

In “putting toys away in accordance with teacher’s instruction,” as a verbal prompt, a prompter told a participant “please put toys away because a recess was over.” As a pointing prompt, a prompter approached a participant and pointed at toys. As a partial prompt, a prompter took a participant’s hand and promoted touching toys. As a manual guidance, a prompter took a participant’s hand and promoted putting toys away.

In “putting up a hand to say something,” as a verbal prompt, a prompter told a participant “please put up your hand.” As a pointing prompt, a prompter pointed at a participant’s arm. As a partial prompt, a prompter took a participant’s hand and promoted putting up his hand halfway. As a manual guidance, a prompter took a participant’s hand and promoted putting his hand perfectly.

In “copying in notebook what teacher wrote on the whiteboard,” as a verbal prompt, a prompter told a participant “please copy in notebook what teacher wrote on the whiteboard.” As a pointing prompt, a prompter pointed at a notebook and the whiteboard. As a partial prompt, a prompter took a participant’s hand and promoted handing a pencil. As a manual guidance, a prompter took a participant’s hand and promoted writing words written on the whiteboard with a pencil.

In “following teacher’s instructions,” prompts depended on the instruction of the teacher. The following is the case when the teacher provided an instruction of “let’s pick up your bag.” As a verbal prompt, a prompter told a participant “please pick up your bag.” As a pointing prompt, a prompter pointed at a participant’s bag. As a partial prompt, a prompter took a participant’s hand and promoted standing up and walking a

little. As a manual guidance, a prompter took a participant’s hand and promoted picking up a bag and coming back participant’s desk.

In “going to the bathroom during recess,” as a verbal prompt, a prompter told a participant “let’s go to the bathroom.” As a pointing prompt, a prompter pointed at the door of the room where this study was conducted. A partial prompt and a manual guidance were provided because urination is a physiological phenomenon.

Prove sessions

The procedure for prove sessions was the same as baseline.

Measurement in elementary school

Three months after the participants had joined elementary school, we visited their schools for measuring targeted behaviors. We observed targeted behaviors during the first hour of a class and a recess after the first hour of class. If the participants performed targeted behaviors appropriately, we never provided prompts and feedbacks. In addition, we never talked to the participants and never presented previous stimuli intentionally. Because every participant was a different classroom, three recorders visited elementary school. The three recorders divided into each classroom and recorded. One of the three recorders was the same as baseline, training, and prove sessions recorder. But two recorders have never recorded their sessions. Incidentally, elementary school teacher didn’t participate this study until we went to elementary school.

Interview and questionnaire for parents

We conducted the interview about participant’s state after entering elementary school for each participant’s parents one month after the intervention was finished. The interview was conducted in a room at a university for about 30 minutes. First and second author acted as interviewers. Main question items in the interview were “a state during class,” “a state during recess,” and “about friend relationship.” However, parents and interviewers talked other than the above depending on the context of the conversation.

In addition, we asked participant’s parents to answer questionnaire to confirm whether participants performed targeted behaviors at elementary school. The questionnaire was mailed to parents. Because the questionnaire was mailed before the interview was conducted, parents gave first author the answered questionnaire when parents came to a university to take the interview. In the questionnaire, name of all targeted behaviors were written on a sheet of A4 paper, and four words of “very well,” “moderately well,” “not at all well,” and “I don’t know” were written next to name of each targeted behavior. Parents required circling the applicable word on

performance of targeted behaviors of participants in elementary school. If there was a targeted behavior with no single circle and a targeted behavior with two or more circles, they were not treated as an effective response and they were not included the data.

The calculation of date and inter-observer agreement

In this study, we recorded a targeted behavior as a correct response if a participant performed a targeted behavior without any prompts by a trainer. The ratio of correct responses was calculated by dividing the number of correct responses in a session by the number of correct plus incorrect responses in a session and multiplying it by 100%.

Inter-observer agreement data was collected by having a second recorder who independently recorded the target behaviors through videotapes used during 50% the sessions in all interventions. In particular, these sessions were the second, fourth, sixth, ninth, eleventh, twelfth session. Reliability was calculated by dividing the total number of agreements by the number of agreements plus disagreements and multiplying it by 100%. Inter-observer agreement was 92%.

Treatment integrity

Treatment integrity was measured using video recording. Authors collected data on the accuracy with which prompters presented prompts and feedbacks during 100% of sessions. When prompters presented prompts and feedbacks correctly, the agreement was scored. Treatment integrity was calculated as the number of agreements divided by agreements plus disagreements, and multiplying by 100. Mean treatment integrity was 97%.

Informed consent

Before this study, the participants and their parents received an explanation of the purpose, procedure, and the expected result through written and spoken description. Additionally, we told them to refuse to participate in this study if the participant felt dissatisfied. As a result, the participants and their parents agreed to the informed consent.

Results

Fig. 1 showed the ratio of correct responses of each targeted behavior.

In “taking out a pencil box and a notebook from a bag, and putting a bag on a hook,” the participants never performed correct responses in baseline. Takuya and Masato showed correct responses from session 7 and maintained correct responses in prove sessions. However, Hirokazu did not perform correct responses except for session 6.

In “putting toys away in accordance with the teacher’s

instruction,” the participants never performed correct responses in baseline. The participants did not stop playing even when a teacher asked them to do so. During training, ratios of correct responses for all the participants were not stable. In prove sessions, the mean ratio of correct responses for Takuya and Hirokazu was 50%; the ratio of correct responses for Masato was 0%.

In “putting up a hand to say something,” the participants never performed appropriate responses in baseline. They made remarks without putting up a hand. Immediately after training was introduced, the ratio of correct responses for Takuya rose to 100%. In addition, the ratio of correct responses for Masato and Hirokazu rose gradually. In prove sessions, the mean ratio of correct response for all the participants was 100%.

In “copying in a notebook what the teacher wrote on the whiteboard,” the ratio of appropriate responses in baseline was 0% for Takuya and Masato and 38% for Hirokazu. Hirokazu performed a correct response soon after the lesson began but he did not copy in his notebook after that. During training, the ratio of correct responses for Takuya rose gradually and rose to 100% in session 5. However, the ratio of correct responses fell after session 7 and fell to 0% in session 9. However, the mean ratio of correct response was 100% in prove sessions. The ratio of correct responses for Masato rose to 100% in session 5. His ratio fluctuated from 50% to 100% depending on the session. The mean ratio of correct responses for Masato was 100% in prove sessions. The ratio of correct response for Hirokazu was 50% until session 6 but rose to 100% in session 7. The mean ratio of correct response for Hirokazu was 100% in prove sessions.

In “following the teacher’s instructions,” mean ratios of correct responses were 30% for Takuya, 42% for Masato, and 38% for Hirokazu in baseline. During training, the ratio of correct responses for Takuya rose to 100% soon and the mean ratio of correct responses was 87% in prove sessions. The ratio of correct responses for Masato was 66% in session 4 but rose to 100% after session 5. The mean ratio of correct responses in prove sessions for Masato was 100%. The ratio of correct responses for Hirokazu was 100% in session 6 and 8. However, it fluctuated between 33% and 100% in other sessions. The mean ratio of correct responses in prove sessions for Hirokazu was 88%.

In “going to the bathroom during recess,” the participants never performed correct responses in baseline. In several cases, they asked a teacher if they could go to the bathroom during the lesson. During training, the ratio of correct responses for Takuya rose to 100% after session 6; the ratio of correct responses for Masato and Hirokazu rose to 100% after

session 7. The mean ratio of correct responses in prove sessions for all the participants was 100%.

For measurement in elementary school, because the participants came to school before we visited their school, we did not measure “taking out a pencil box and a notebook from

a bag, and putting a bag on a hook.” For “putting toys away in accordance with the teacher’s instruction,” the number of measurements were 2 for Takuya, Masato, and Hirokazu. For “putting up a hand to say something,” the number of measurements were 13 for Takuya, 11 for Masato, and

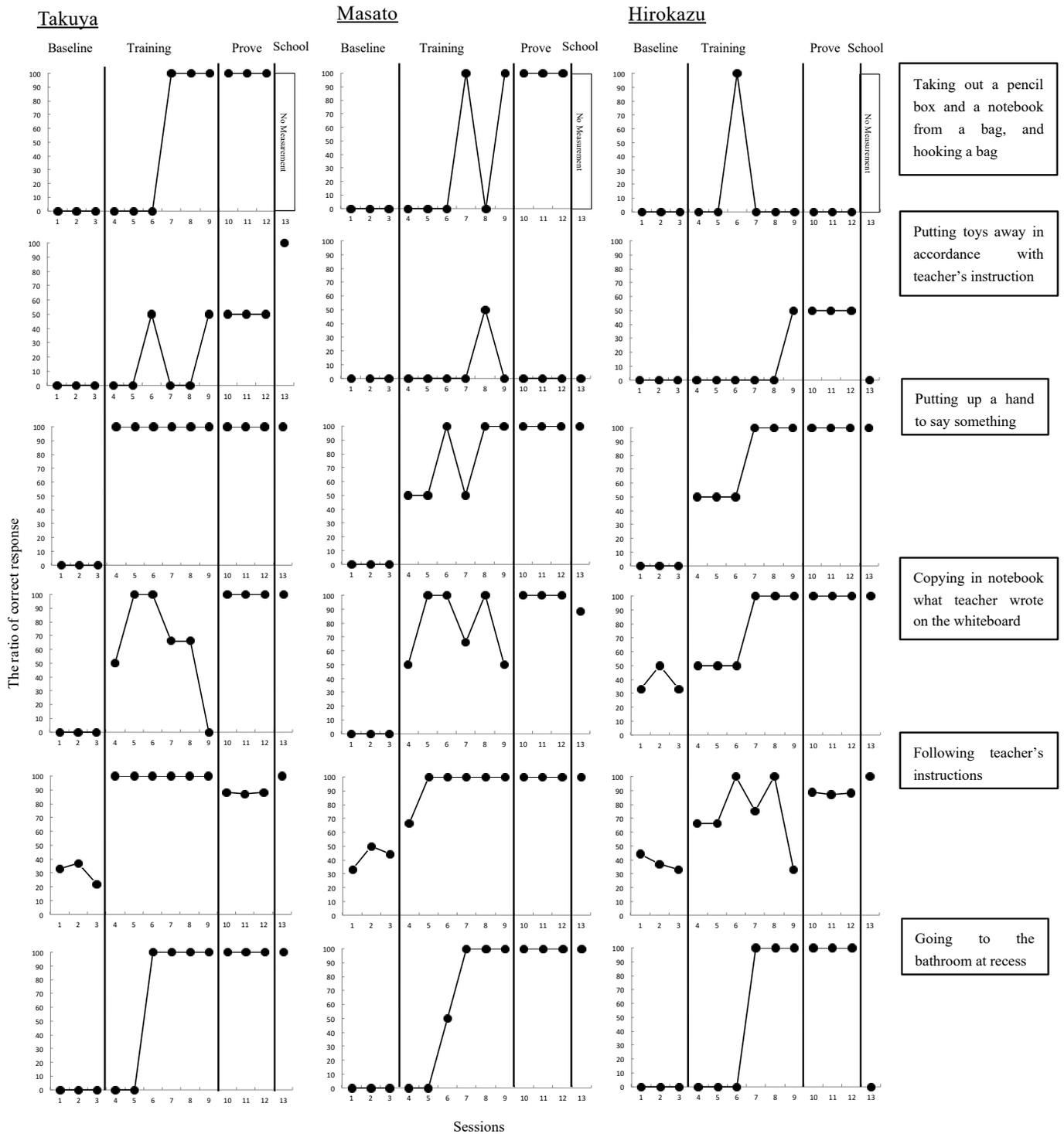


Fig. 1 The ratio of correct responses of each behavior

The number of measurements were 2 for “putting toys away in accordance with the teacher’s instruction,” 11 for “putting up a hand to say something,” 9 for “copying in a notebook what the teacher wrote on the whiteboard,” 5 for “following the teacher’s instructions,” and 1 for “going to the bathroom during recess.”

Takuya appropriately performed all targeted behaviors. Masato appropriately performed “putting up a hand to say something,” “following the teacher’s instructions,” and “going to the bathroom during recess.” However, he never performed “putting toys away in accordance with teacher’s instruction,” and the ratio of correct responses for Masato in “copying in a notebook what the teacher wrote on the whiteboard” was 88%. Hirokazu performed appropriately “putting up a hand to say something,” “copying in a notebook what the teacher wrote on the whiteboard,” and “following the teacher’s instructions.” However, he never performed “putting toys away in accordance with the teacher’s instruction” and “going to the bathroom during recess.”

In the interview after the intervention was finished, to the question of “a state during class,” Takuya’s parents told “he enjoys his school life, and he raises his hand for saying opinion.” Masato’s parents told “he raises his hand for saying opinion. However, he is not very good at language arts.” Hirokazu’s parents told “he can copy in notebook what a teacher writes in a blackboard every day. He often says the wrong answer, but he positively raises his hand to answer a question in a class.” To the question of “a state during recess,” Takuya’s parents told “he likes playing with skipping rope with friend during a recess.” Masato’s parents told “he can put away toys quickly when a recess is over. He often plays with clay, and he is good at making spaghetti with clay.” Hirokazu’s parents told “he plays with tags and soccer with friends. But he cannot invite friends to play. When he plays alone, he collects leaves and stones.” To “about friend relationship,” Takuya’s parents told “there is no problem about friendship. He always talks about his friends at dinner time.” Masato’s parents told “he enjoys playing with his friends. He seems to want to exercise leadership, so he makes various instructions to friends.” Hirokazu’s parents told “he sometimes invites by his friends and go to play afterschool. I am worried that he touches his friends excessively.”

All participant’s parents answered the questionnaire. Takuya’s parents circled all items except for “putting up a hand to say something.” They circled “I don’t know” in “putting up a hand to say something.”

Discussion

This study examined the effect of simulation training on the acquisition of learning-related skills that would be necessary for children with autism spectrum disorders in elementary school. As a result, all the participants acquired almost all targeted behaviors. Moreover, these targeted behaviors generalized to elementary school. These results showed that simulation training positively affects the acquisition of learning-related skills and expanded the literature on learning-related skills (Ducharme & Ng, 2012; Lloyd et al., 1989) and simulation training (Bellini et al., 2007; Palmen et al., 2008). In addition, although this study did not use systematic and special reinforcers such as a token, the participants could acquire learning-related skills. This means that the participants were reinforced with natural consequence stimuli following each skill (e.g., the progress of a handicraft work in “following the reinforcers teacher’s instructions.”) Similar results were seen in previous studies. For example, Sancho, Sidener, Reeve, and Sidener (2010) showed that the systematic and special reinforcers were unnecessary for children with autism spectrum disorders to acquire play skills. Discovering such behaviors or skills is important to develop a cost-effective procedure.

On the contrary, certain targeted behaviors were not acquired by the participants. Not all the participants acquired “putting toys away in accordance with the teacher’s instruction.” Hirokazu did not acquire “taking out a pencil box and a notebook from a bag, and putting a bag on a hook.” A possible reason why the participants did not acquire “putting toys away in accordance with the teacher’s instruction” is that consequences following “putting toys away in accordance with teacher’s instruction” were aversive stimuli such as the termination of play time. In addition, a possible reason why Hirokazu did not acquire “taking out a pencil box and a notebook from a bag, and putting a bag on a hook” is the existence of competitive behaviors. Immediately after Hirokazu arrived in the room located in the educational institution, he hurried to a place that had toys. This fact means that playing with toys competed with “taking out a pencil box and a notebook from a bag, and putting a bag on a hook” for Hirokazu. It is possible that the existence of competitive behaviors hindered the acquisition of “taking out a pencil box and a notebook from a bag, and putting a bag on a hook.”

In this study, participants were required to perform “going to the bathroom during recess” twice in one session. So, participants went to the bathroom twice in a short time. Although it was due to effective intervention, this intervention may have promoted urinary frequency. As a result, participants didn’t become urinary frequency according to

their parent's interviews in this study. Nevertheless, future study should examine an intervention with less possibility of promoting of urinary frequency.

From those stated above, there are two points of attention in teaching learning-related skills. First, systematic and special stimuli such as a token may not be necessary for children with autism spectrum disorders to acquire learning-related skills if children were reinforced completely with natural consequence stimuli. Second, systematic and special stimuli should be used if the use of natural consequence stimuli alone is ineffective in acquiring learning-related skills. Future study should examine the effect on training given these points.

After the participants enrolled in elementary school, they performed almost all targeted behaviors appropriately. This result shows the effect of simulation training on the acquisition of learning-related skills in elementary school. On the contrary, Masato and Hirokazu did not perform "putting toys away in accordance with the teacher's instruction" in elementary school. However, the participants had not already acquired this skill during training. This means that a learning-related skill that children with autism spectrum disorders did not acquire in a training setting may not be acquired naturally after they enroll in elementary school. To solve the problem, it may be useful to conduct follow-up sessions until the participants have acquired all learning-related skills. Or it may be useful for an elementary teacher to conduct procedures of Ducharme and Ng (2012) and Lloyd et al. (1989) that are known to be effective in elementary school.

There were three notable limitations of this study about the generalization measurement. First, it was a lack of measurement of generalization about "taking out a pencil box and a notebook from a bag, and putting a bag on a hook." Second, the generalization measurement was conducted only once. Due to these two limitations, while the intervention of this study was effective on the acquisition of targeted behaviors, it was not obvious clearly that the intervention of this study was effective on the generalization of targeted behaviors. It is important to establish the effectiveness of the intervention on the acquisition of learning-related skills since there have been few studies that proved the effective intervention for acquiring of learning-related skills so far. However, it is also important to confirm the effect of the intervention on the generalization, especially for learning-related skills required to perform in elementary school. To increase the rigorous of the result of this study, the generalization measurement should be conducted more times in future study. Third limitation was that the measurement in elementary school was conducted three months after the

intervention was finished. Because learning-related skills may have been taught and reinforced by a teacher in elementary school,

Future studies should develop a neat solution to these limitations such as making a request to elementary teachers for measuring targeted behaviors.

Another limitation is the use of ABA design. To examine the relation between independent variables and dependent variables more strictly, we should have used multiple baseline design. To examine whether the procedure of this study is really effective, future studies need to use more rigorous research design.

Conclusion

This study showed that simulation training was effective in the acquisition and generalization of learning-related skills. Learning-related skills have great influence on the adjustment of elementary school (McClelland et al., 2006). Therefore, further study is required to develop procedures for acquisition and generalization of learning-related skills that are expected to be needed in elementary school.

References

- Ayres, K. M., Maguire, A., & McClimon, D. (2009). Acquisition and generalization of chained tasks taught with computer based video instruction to children with autism spectrum disorders. *Education and Training in Developmental Disabilities*, 493-508.
- Bellini, S., Peters, J. K., Benner, L., & Hopf, A. (2007). A meta-analysis of school-based social skills interventions for children with autism spectrum disorders. *Remedial and Special Education*, 28(3), 153-162.
- Conn-Powers, M. C., Ross-Allen, J., & Holburn, S. (1990). Transition of young children into the elementary education mainstream. *Topics in Early Childhood Special Education*, 9(4), 91-105.
- Daley, T. C., Munk, T., & Carlson, E. (2011). A national study of kindergarten transition practices for children with disabilities. *Early Childhood Research Quarterly*, 26(4), 409-419.
- Ducharme, J. M., & Ng, O. (2012). Errorless academic compliance training: A school-based application for young students with autism spectrum disorders. *Behavior Modification*, 36(5), 650-669.
- Hashimoto, S., Watanabe, T., Hayashi, A., Kumise, A., Kudo, T., Otomo, K., Yasunaga, K., & Taguchi, E. (2012). The practice program of inclusive education for children with intellectual disorders and developmental disorders.

- Fukumura shupan.
- Janus, M., Lefort, J., Cameron, R. & Kopechanski, L. (2007)
Starting kindergarten: Transition issues for children with special needs. *Canadian Journal of Education*, 30(3), 628-648.
- Lattimore, L. P., Parsons, M. B., & Reid, D. H. (2008).
Simulation training of community job skills for adults with autism spectrum disorders: A further analysis. *Behavior analysis in practice*, 1(1), 24.
- Lloyd, J.W., Bateman, D.F., Landrum, T.J., & Hallahan, D P. (1989). Self-recording of attention versus productivity. *Journal of Applied Behavior Analysis*, 22, 315-323.
- McClelland, M. M., Acock, A. C., & Morrison, F. J. (2006)
The impact of kindergarten learning-related skills on academic trajectories at the end of elementary school. *Early Childhood Research Quarterly*, 21(4), 471-490.
- McClelland, M. M., Morrison, F. J., & Holmes, D. H. (2000)
Children at-risk for early academic problems: The role of learning-related social skills. *Early Childhood Research Quarterly*, 15(3), 307-329.
- Milsom, A. (2007). School counselor involvement in postsecondary transition planning for students with disabilities. *Journal of School Counseling*, 5 (23). Retrieved from <http://www.jsc.montana.edu/articles/v5n23.pdf>
- Muto, T., Tsuge, Y., Kaminaga, M., & Kawamura, H. (2005)
The childcare and the transition support to elementary school for LD, ADHD, and high functioning autism – the intervention for children with LD, ADHD, and high functioning autism. Toyokan shupansha.
- Palmen, A., Didden, R., & Arts, M. (2008). Improving question asking in high-functioning adolescents with autism spectrum disorders. Effectiveness of small-group training. *Autism spectrum disorders*, 12(1), 83-98.
- Rimm-Kaufman, S. E., Pianta, R. C., & Cox, M. J. (2000)
Teacher's judgments of problems in the transition to kindergarten. *Early Childhood Research Quarterly*, 15 (2), 147-166.
- Sancho, K., Sidener, T. M., Reeve, S. A., & Sidener, D.M. (2010) Two Variations of Video Modeling Interventions for Teaching Play Skills to Children with Autism spectrum disorders. *Education and Treatment of Children*, 33(3), 421-442.