Practical Research

The Effects of Selection and Intervention in Social Play Based on an Ecological Assessment of a Child with Autism Spectrum Disorder at a Kindergarten

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This study was conducted on the selection of and intervention in social play based on an ecological assessment of a child with autism spectrum disorder at a kindergarten. The ecological assessment was based on the five following factors: (a) the participant’s preferences, and social and cognitive play levels; (b) the peers’ preferences, and social and cognitive play levels; (c) the human and physical aspects of the play setting; (d) the frequency and duration of play per week; and (e) the teachers’ rules governing the play. The selection of the target play was based on the ecological assessment. The participant was taught the play skills in the classroom. The results revealed the participant engaged in the play and increased his playtime with his peers. Interaction between the participant and peers also increased during the free playtime. This study suggests that the ecological assessment indicated the necessary conditions for play and enabled the researchers to select the social play that the participant could engage in and which was feasible in the classroom.

Key Words: autism spectrum disorder (ASD), social play, ecological assessment, kindergarten

Introduction

Play, that is, children’s self-initiated activity is an important aspect of learning that lays the foundation for balanced physical and mental development (Ministry of Education, Culture, Sports, Science and Technology, 2008). Children nurture relationships with their peers through play and in turn, play promotes the growth of individuals through these interrelations (Ministry of Health, Labor and Welfare, 2008). Therefore, play is regarded as an important children’s activity.

Children with autism spectrum disorder (ASD) experience pervasive challenges in the development of symbolic play and social engagement with peers (Wolfberg, DeWitt, Young, & Nguyen, 2015). Furthermore, their play may often be skewed by restricted interests and stereotypic or repetitive patterns of behavior. Consequently, children with ASD may have limited opportunities to interact with their peers, acquire appropriate opportunities to play, and develop other critical developmental skills (Jung & Sainato, 2013). Furthermore, without explicit support, they are likely to remain isolated and deprived of consistent interactive play experiences that may encourage developmental growth and meaningful peer relationships (Wolfberg, Bottema-Beutel, & DeWitt, 2012).

Several studies have been conducted to teach social play with peers to children with ASD. Jung and Sainato (2015) used video modeling interventions in which the special interests of children with ASD were embedded so as to teach them games. Results revealed that they increased their engagement with the games and their social interactions with play partners. Miltenberger and Charlop (2014) attempted to teach children with ASD how to play two common athletic group games. A most-to-least prompting procedure was used for athletic skills, and was reinforced with verbal praise and tokens. The results showed that the participants increased their group play, dem-
onstrated gains in speech, and mastered the targeted athletic skills. Previous studies have found that children with ASD are able to participate in social play if taught how and as a result, display increased interaction with their peers.

However, behavioral interventions designed to teach play skills lack generalization and maintenance measures, and depend on highly structured and contrived contexts and intervention components (Lang, Machalicek, Rispoli, O’Reilly, Sigafoos, Lancioni, Peters-Scheffer, & Didden, 2014). Only a paucity of empirical intervention studies have implemented the teaching of social play skills to children with ASD in early childhood education and care settings such as kindergartens and nurseries in Japan. Ito (2014) noted that children with disabilities in inclusive nursing care are given specific tasks; thus, a tendency to focus on such tasks at the expense of intervention in play may be created. Liber, Frea, and Symon (2008) recommended that future studies should address the teaching of play skills, which should be followed by an assessment of the generalization of the targeted skills into natural settings with typically developing peers or with family members. Mastrangelo (2009) explained that play can be incorporated into a student’s individualized education program and stressed that teachers should consider the implications of a play-based curriculum in an inclusive classroom. Therefore, it is imperative to conduct research on teaching social play skills for children with ASD in early childhood education and care settings.

When social play intervention is implemented in early childhood education and care settings, the characteristics of these settings should be focused. The results of a basic survey of early childhood education and care (Benesse Education Research and Development Institute, 2012), daily programs, the environment and equipment, and number of children and caregivers vary considerably in early childhood education and care settings such as kindergartens and nurseries in Japan. According to Muto (2003), very different programs and environments coexist in early childhood education and care settings in Japan. It seems as though the settings and frequency of play scenes vary considerably across kindergartens and nurseries. It is imperative to select play and interventions that are based on the characteristics of children’s play as well as those of early childhood education and care settings.

Ecological assessment is one method of assessing and analyzing the responses of the learner as well as various ecologies (Heron & Heward, 1988). Ecological assessment can provide valuable information about children’s behavior and the various settings in which they perform (Carroll, 1974). Ecological assessment, through observations and interviews, examines physiological conditions, the physical aspects of the environment such as lighting, seating arrangements, and noise level, interaction with other individuals, practitioner-client interaction, home environment, and past reinforcement history (Cooper, Heron, & Heward, 1987). In order to teach a student with ASD functional communication skills, Einaga and Aoyama (2012) conducted the following ecological assessment of a student: (a) interests and reinforcement factors; (b) cognitive level and cognitive behavior characteristics; (c) learning content and study setting; and (d) human aspects and physical aspects of the classroom. However, only a few studies have implemented social play intervention based on an ecological assessment of children with ASD in early childhood education and care settings. Furthermore, it is unclear what kinds of assessment items are necessary. Fujiwara and Sonoyama (2018) examined the effects of selection and intervention of social play based on the ecological assessment of a child with ASD. The results of the selection and intervention of social play in a center for early childhood education and care revealed that five assessment factors are required in an ecological assessment: (a) children’s preference, and levels of social and cognitive play; (b) their peer’s preference, and levels of social and cognitive play; (c) human and physical aspects of the play environment; (d) frequency and duration of play per week; and (e) the teacher’s rules governing the play. However, it has not been determined whether these factors can be applied to other early childhood education and care settings and with a variety of participants. Furthermore, it is important to examine maintaining social play in classrooms.

The purpose of this study was to evaluate the effectiveness of the selection of social play and intervention based on the ecological assessment of a child with ASD at a kindergarten. Furthermore, we investigated how the classroom teacher and assistants maintained social play.
Method

Participant

The participant was a Chinese boy who had ASD and an intellectual disability. He was five years four months old at the outset of the study. He was enrolled in a kindergarten that had a general education classroom, which he attended three days a week. On other days, he attended a child development support center and university-based clinic. The 2001 Kyoto Scale of Psychological Development (Ikuzawa, Matsushita, & Nakase, 2002) revealed that his total developmental age was one year 10 months (DQ38), physical-motion age was two years four months, cognitive-adaptation age was two years, and verbal-social age was 10 months. He could imitate one-step motor responses and short utterances. He received support in daily living skills including eating, dressing, and using the toilet. During the kindergarten's group activities, he was able to remain in the room, but he sometimes lay down or left the room. When a song or music was played, he often covered his ears and lay face-down. He frequently engaged in physical and sensory play.

Peers

His peers were typically developing classmates between four and five years of age. However, they were not identified, but children who participated spontaneously in the target play. If his peers did not participate spontaneously in the target play, the teacher and assistants invited children nearby to play. In most of the sessions between one and five of his peers participated spontaneously in the target play.

Setting

The study was conducted in the full-day kindergarten classroom that the participant attended together with 15 typically developing children; the classroom teacher and two assistants also participated. The study was conducted during free playtime in the classroom (8 m×5.5 m). Intervention sessions were implemented by the classroom teacher, assistants and first author (the experimenter). The participant's peers comprised children in his class. The experimenter was a graduate student who had a kindergarten teacher's certificate and two years of experience as a kindergarten teacher.

Ecological Assessment

The ecological assessment was based on the following five factors: (a) the participant's preference, and level of social and cognitive play; (b) his peers' preference, and level of social cognitive play; (c) human and physical aspects of the play setting, (d) frequency and duration of play per week; and (e) the teacher's rules governing play. The details of the ecological assessment are described below and the results are presented in Table 1.

Observation of play setting. The experimenter observed free play in and outside the classroom for four days. To assess factors (a) and (b), the experimenter recorded which play materials the participant used, how he played using these materials, his interaction with his peers, and the time engaged in play. The same procedure was followed for his peers. To assess factor (c), the play area setting and the number of teachers and assistants that were involved were assessed.

Interviews. To assess factors (a), (d), and (e), the teacher and assistants were interviewed to determine the participant's preferences regarding play and interactions with peers. The teacher was also interviewed about the frequency and duration of the free play session per week, selection of play, how the participant's play could be supported, and plans for play sessions.

Selection of a Play

The results of the ecological assessment revealed that the participant's level of social play level could be characterized as solitary play or parallel play. His cognitive level of play could be classified as physical and sensory. His preferences included rolling objects and dropping sand. His play was characterized by the use of his body and acquiring physical sensations. On the other hand, his peers' social level of play was classified as associative play or cooperative play, and their cognitive level of play as constructional play, role play, and team games. At the beginning of the study, when in the classroom, there were only a few types of play in which the participant could participate because of the differences between his level of play and those of his peers. Consequently, when we selected a target play, it was necessary to consider his preferences, level of play, and the characteristics of play in which he could participate. During playtime, help from the assistant was always available. On most days he had approximately one hour of free playtime.
in the classroom. Accordingly, intervention sessions were conducted in the classroom.

This information suggested the conditions of the target play should be as follows: (1) rolling or dropping something; (2) using the body and/or causing a physical sensation; (3) interaction with peers; and (4) implementation in the classroom. Based on these conditions, the teacher and experimenter discussed what kind of play was appropriate and selected a ball-rolling game. This game, involving two or more children, involves rolling a ball down a slide. Child A rolls the ball from the top of the slide and child

### Table 1  Ecological Assessment Results

| Item                        | Ecological assessment               |
|-----------------------------|-------------------------------------|
|                             | Observation                        | Interview                                |
| **The participant**         |                                     |                                         |
| Play Preference             | Classroom: Rolling beads and acorns, physical play | Classroom: Rolling beads and acornsphysical play |
|                             | Outside: Sandbox, swings, and slide  | Outside: Sandbox, swings, and slide       |
| Social Play Stage           | Solitary play or parallel play      | Play in the same area as his peers       |
|                             |                                     | Hugging or touching peers                |
| Cognitive Level of Play     | Physical play and sensory play      | Rolling objects and dropping sand         |
| Characteristic of the Play  | Using the body or play that provides physical sensations | —                                       |
| Participated in             |                                     |                                         |
| **Peers**                   |                                     |                                         |
| Preference of Play          | Classroom: Spinning tops, building blocks, card games, and role play | —                                         |
|                             | Outside: Sandbox, horizontal bar, and ball games |                                         |
| Social Play Stage           | Associative play or cooperative play | —                                         |
| Cognitive Level of Play     | Constructional play, role play, and team games | —                                         |
| **Human Aspects**           | Classroom: The teacher and two assistants | —                                         |
|                             | Outside: Two or four teachers and two or three assistants | —                                         |
| **Physical Aspects**        | Classroom: Individual play stations (i.e., drawing, card games, play kitchen) are arranged in the classroom | —                                         |
|                             | Outside: Playground equipment (i.e., swings, slide, horizontal bar) and sandbox are available in the playground | —                                         |
| **Play setting**            |                                     |                                         |
| Frequency and Length of Play Time | —                                     | One hour of free play time in the classroom on most days, 30 minutes of outside play if the weather is sunny |
| Teacher’s Rules Governing Play | Selection —                         | The teacher decides based on experience, taking into account the season and class situation |
|                             | Support —                          | Set play materials and model of play      |
|                             | Plan —                             | Chair games and jump rope                |

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B catches it at the bottom of the slide. Child A then slides down the slide after rolling the ball. Child B moves to the top of the slide with the ball and the process is repeated; the children take turns.

**Materials**

A slide and stands were used during both the intervention and maintenance. A ball with an approximate diameter 20 cm was used in intervention sessions 5–7, but from intervention session 8, balls about 6 cm in diameter and a basket were used. In Fig. 1, the classroom setting for both the intervention and maintenance is illustrated.

**Procedure**

**Baseline.** During baseline probes, the participant’s play was observed during his free play in the classroom for four days. The teacher and assistants were asked to support the participant in the usual way during this time. The experimenter did not prompt him.

**Intervention.** Before intervention sessions, the teacher explained the ball-rolling game to the participant’s peers during their free playtime in the classroom. After several practices, the peers were able to play the ball-rolling game. When the intervention started, in session 5, a slide and stands were placed in the classroom and the experimenter or the assistant led the participant to the ball-rolling game. If the participant demonstrated the skills needed for the game, he was given physical and verbal reinforcement. If he could not, physical, partial physical, and gesture prompts were provided. In session 5, the experimenter assisted the participant in the ball-rolling game and provided reinforcements and prompts. From session 6, the assistant led him to the ball-rolling game and gave him reinforcements and prompts. When the participant left the play area of the ball-rolling game or got involved in other play, the session ended. From session 8, the ball was replaced by small balls, which were put in a basket because the participant was less able to catch the ball directly. One or two blocks were implemented per intervention session; on average, one block consisted of an average of six trials. Intervention sessions continued until the participant reached a skill level of 80%.

**Maintenance.** The teacher and assistants were asked to support the participant in the usual way during free play in the classroom; similar to the baseline intervention. However, he was not prompted by the experimenter. A slide and stands were placed in the classroom.

**Measures**

Throughout the study, videotaped sessions were observed to assess the participant’s game skills, social play engagement, and interaction. The first 30 minutes of free play in the classroom were included in the observation because free playtime varied in accordance with the daily program.

**Target play skills.** The participant’s game skills were assessed during the intervention sessions. The

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Fig. 1  Intervention and Maintenance: Classroom
A ball-rolling game required four skills: (1) rolling a ball from the top of the slide; (2) sliding down the slide; (3) catching the ball with his hands or putting it in a basket; and (4) returning to the top of the slide with the ball(s). The percentage of correct performances was calculated by dividing the total number of independent skills by the number of independent skills plus prompted skills, and multiplying this by 100.

Social play engagement. Social play engagement was defined as the length of time the participant played with his peers by interacting with them and using the same materials. The time from the start to the end of social play was measured. The start of social play engagement was recorded when the participant started to play with his peers by interacting with them and using the same materials. The end was recorded when the participant or peers left the play area or began playing with other materials.

Interaction. Interaction was defined as communication about play, play behaviors, other communication, other behaviors, and physical contact (see Table 2). The number of interactions initiated by the participant with his peers and vice versa was recorded.

Inter-Observer Agreement

Inter-observer agreement data were collected and analyzed to ensure the credibility of the coded data. The experimenter and second observer viewed 30% of the videotaped sessions on average for all conditions. Furthermore, the degree of inter-observer agreement was calculated. The definitions of dependent measures were explained to the second observer in advance. The agreements for the baseline, intervention, and maintenance were as follows: target play skills: 91%; social play engagement: 99%; and interaction: 92%.

Social Validity

After the study, the teacher and assistants were asked to provide information to assess social validity. They completed a survey that included items to assess the acceptability of the game and the procedure. The survey used a 6-point rating scale, in which 1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = somewhat agree, 5 = agree, and 6 = strongly agree.

Ethical Considerations

The study was approved by the Ethics Committee of the Graduate School of Comprehensive Human Sciences of the University of Tsukuba. Before the study, the first author gave consent forms to the head of the kindergarten, classroom teacher, and participant’s mother. The experimenter then explained the purpose and methods of the study to them and emphasized that they had the right not to participate. Their consent to participate in the study and for the publication of a paper thereof was obtained.

Results

Target Play Skills

The participant displayed an increase in the skills needed to play the game after intervention session 7 (see Fig. 2). In intervention sessions 5–7, he was unable to catch the ball and return to the top of the slide. However, from session 8, in which the ball was replaced with small balls, he was able to put the balls in the basket and return to the slide.

Social Play Engagement

The participant did not engage in social play dur-
ing baseline probes, but spent most of the time dropping and rolling beads during the free playtime. He increased his social play during the intervention and maintenance (see Fig. 3). During the maintenance, he mainly played the ball-rolling game and occasionally tipped balls out of the basket with his peers.

**Interaction**

The number of interactions initiated by the participant with his peers and vice versa increased after intervention session 4 (see Figs. 3 and 4). During the baseline, the participant made physical contact, specifically, hugged or touched his peers, but did not demonstrate communication or behaviors related to social play. During the intervention phase, his interaction with his peers increased: he demonstrated communication skills such as gestures asking for the ball and behaviors like rolling a ball to his peers in relation to the game. When playing the ball-rolling game during the maintenance, he demonstrated interaction with his peers.

Although the participant's peers interacted with him during the baseline, their interaction did not include communication or behaviors related to social play. The number of interactions initiated by the peers with the participant increased during and after the intervention phase. His peers demonstrated communication (e.g., “here we go!” and “going to roll it now!”) and behaviors (e.g., rolling the ball to a participant and handing them the ball) related to the game. During the maintenance, the participant’s peers interacted with him during social play.

**Social Validity**

The teacher and assistants responded positively to the social validity assessment questions (see Table 3).
They indicated that the intervention goal was meaningful for the participant. They also asserted that the intervention procedure was an acceptable way of teaching the participant. However, the teacher only agreed somewhat that the target play was appropriate for the participant’s classroom peers. Assistant 1 agreed somewhat that the target play consisted of interactive play. Assistant 2 agreed somewhat that the participant participated easily in the play.

**Discussion**

This study implemented the selection of and intervention in social play based on an ecological assessment of a child with ASD at a kindergarten. The results revealed that the child’s participation in the game was based on ecological assessment and he increased his playtime with his peers. The participant increased his interaction with his peers in the intervention and maintenance more than during the baseline probes.

The selection of the target play was based on the ecological assessment that had been designed to provide valuable information not only of the child’s behavior, but also about the various settings in which the child performed (Carroll, 1974). The ecological assessment of this study assessed the play of a child with ASD, his peers’ play, the play setting, the frequency of interactions, and the type of play.
quency and duration of the playtime, and the teacher's rules governing play. The results of this assessment revealed that because of the differences between his play levels and those of his peers, it was necessary that the selected target play was based on his playing preferences, his play levels, and the nature of play in which he was able to participate. Therefore, the ball-rolling game was selected. From session 8, the larger ball was replaced with a set of smaller balls that were collected at the bottom of the slide and transferred to a basket. The skills for this game were mastered relatively quickly. The selection of the game was also based on the play setting, frequency and duration of the playtime, the teacher's rules governing play, and its potential for application during the free classroom playtime. It also permitted the game to be continued after the intervention phase. Furthermore, his peers who had not played much with their friends could participate in the game during the intervention and maintenance. It was easy for some peers to participate in the game as it was based on the ecological assessment. The results of the study suggest that the ecological assessment clearly indicated the necessary play conditions and enabled the selection of play that the child with ASD could participate in and which was feasible in the classroom. Ecological assessment appears to be useful for the selection of and intervention in social play between children with ASD and their peers in natural settings.

Before this study, the participant had not interacted with his peers during free play even if they were nearby. He only interacted with his peers by rolling balls toward them. The number of interactions initiated with his peers increased during both the intervention and maintenance: he gestured to ask for the ball and rolled the ball toward his peers. His peers interacted slightly with the participant during the baseline, but increased their interactions with him during intervention and maintenance sessions. It is of interest that communications and behaviors about the game directed at the participant began to occur during the intervention. The reason for this appears to be that the ball-rolling game featured social play including interactions, and the teacher's and assistants' conversations with the participant at playtime acted as a model for his peers. This study extends the existing literature by demonstrating that intervention in social play for children with ASD at kindergartens can facilitate their social play skills and interactions with typically developing peers (Jung & Sainato, 2015; Liber et al., 2008; Miltenberger & Charlop, 2014).

This study has several limitations. The child with ASD often participated in the ball-rolling game during the maintenance, but when not actually participating in the ball-rolling game, he rarely played with his peers. This indicates that although the game was maintained, it was not extended to other forms of play. This study focused on one game because the intervention was limited and the participant only attended the kindergarten a few days each week. Furthermore, during the study, there was no opportunity for intervention in outdoor play because of the bad weather and infectious disease epidemics. It is recommended that future studies focus on multiple forms of play and in different locations. In addition, although this study examined interaction in the play setting, it was not examined in other settings. Future studies should also examine changes in social interactions in other daily activities.

In the survey on social validity, the teacher agreed only slightly that the target play was appropriate for the participant's peers. The teacher felt that the play was too infantile for typically developing peers. Future studies may need to select a game from the perspective of how a child with ASD can participate in play that is also appropriate for typically developing peers.

This study provided no information on the effects of selection and intervention in social play that was based on the ecological assessment of other individuals with ASD. Future studies should investigate interventions for children of different ages and with varying levels of play. It will also be necessary to evaluate the effects of the selection and intervention in social play based on an ecological assessment of children with ASD in a wide range of early childhood education and care settings.

Acknowledgment

We are grateful for the cooperation of the children and the kindergarten teacher and assistants. We presented an outline of this study at the 55th Annual Conference of the Japanese Association of Special Education.
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