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THE EFFECTIVENESS OF PEER-MEDIATED LEGO-BASED INTERVENTION TO IMPROVE THE SOCIAL SKILLS OF PRIMARY SCHOOL STUDENTS WITH ASD

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ABSTRACT

Peer-mediated LEGO-based interventions have been a promising intervention to enhance the social skills of primary school students with ASD. This study examines the effectiveness of peer-mediated LEGO-based intervention in improving the social skills of primary school students in an integrated government school, looking into the findings, challenges, and recommendations. This LEGO-based intervention is a structured activity focusing on social initiations and responses. A total of 30 students, 10 students with ASD and 20 typically developing students, participated in a seven-week intervention that psychology students facilitated. These students were organized into ten groups, each consisting of two typically developing children and one child diagnosed with ASD. The findings showed a significant improvement in social skills regarding social responses and social initiations from the third week onwards. In addition, there was a slight decrease in the peer prompts by typically developing children post-intervention, which indicates that there are great opportunities for individuals with ASD to develop their independence. However, there are challenges faced during the intervention, which include limited resources, an unconducive environment, and time constraints. Regardless of the challenges, the findings showed a significant increase in social skills among primary school students with ASD. The results have implications that notify important authorities, such as educators and practitioners, to advocate for having a structured social skill intervention accommodated in government schools. Increasing the funds for necessary resources, such as intervention materials and teacher training, helps create an inclusive environment and support the social development of children with ASD.

***Keywords**:* peer-mediated, LEGO-based intervention, Autism Spectrum Disorder, integrated school, social skills

INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition that is distinguished by impairments in social communication skills, repetitive and restricted behaviors, and attentiveness during the early stage of development (American Psychiatric Association, 2013). Past studies have found that individuals with ASD struggle to have social interaction with others due to a lack of understanding of social cues and behaviors in social situations (Stagg et al., 2022). Furthermore, they have difficulties approaching others and, most importantly, maintaining conversations while

maintaining eye contact (Lorenzo et al., 2018). It is a challenging process to teach social communication skills to children with ASD. This is because the process involves identifying, interpreting, and replicating social behaviors in different social settings while focusing on their education. However, teachers, parents, and professionals can foster the social communication skills of children with ASD by executing effective intervention strategies. This can be done using various resources and techniques (Ashori & Jalil-Abkenar, 2019).

The prevalence of autism spectrum disorder (ASD) reported worldwide is one in 160 children, whereas in Malaysia, it is approximately 1.6 in 1000 adults or 1 in 625 children (WHO, 2023). To support this statement, there has been a 30% increase in the number of children diagnosed with Autism in the National Autism Society of Malaysia (NASOM) (Niza Shair et al., 2024). ASD is categorized by a spectrum range from mild to severe, including Asperger's syndrome (Kim, 2015). Children with high-functioning autism possess good cognitive and communication skills. However, they have difficulties interacting with others, hindering their daily activities. Children with low-functioning ASD display severe cognitive and behavioral problems, including physical aggression, self-injurious behavior, and meltdowns (Edelson, 2022). The impairments in verbal and nonverbal communication are an important aspect of explaining the social challenges faced by children with ASD, such as not being able to recognize, understand, and reply to social cues. It gets even more challenging when they come across different phases of the developmental stage (Liu, 2023).

Lego-based intervention is a social skills approach that is used to address the social skills impairments of children with ASD. This approach is known for its naturalistic way of anticipating social skill instruction compared to traditional social skill approaches. The skills targeted in this approach, apart from social skills, are problem-solving, turn-taking, and cooperation (Radley et al., 2020). In the LEGO intervention, children are assigned to different roles, and they are expected to work together to build the LEGO structure according to the instructions provided. Past research by Sun and Winoto (2019) has shown that LEGO bricks are known as a medium to improve the social communication skills of children as early as 18 months. This approach is very structured and systematic, which encourages children with ASD to initiate interactions with their peers (Sun & Winoto, 2019). Despite these positive outcomes, LEGO interventions are also open to several limitations, one of which is that the intervention has not been synthesized in Malaysia. By synthesizing, the current study will provide insight into the benefits of interventions and how they can be developed to enhance the social skills of children with ASD.

Amidst the increase in the number of children diagnosed with ASD, it is important to highlight the effectiveness of interventions to foster the social and communication skills of children with ASD (Watkins et al., 2017). This study aims to contribute to developing social communication skills in children with ASD. It is important to address the challenges of children with ASD in the early stages so that early intervention programs can be implemented. Apart from that, intervention that involves the children's peers greatly impacts the social communication skills of children with ASD in an integrated environment. LEGO-based intervention plays a significant role in developing and maintaining a positive relationship with peers. Past studies have mentioned that peer-mediated LEGO-based intervention is very convenient for teachers to include during peer play in their daily schedule. This intervention uses limited resources, does not cost much to hire a specialist or professional, and is organized and structured (Hu, 2018). The findings of this study will be a great contribution to teachers, parents, and schools in providing better service and assistance for students with ASD to improve their social skills.

This study focuses on the effectiveness of peer-mediated LEGO-based interventions to improve the social communication skills of primary school autistic children in an integrated setting. The following research questions were addressed in this study: 1) Does LEGO-based therapy facilitated by peers effectively enhance social skills in primary school students diagnosed with ASD? 2) Does the level of social skills of primary school students with ASD improve as a result of LEGO-based intervention? 3) Do the prompts from peers increase or decrease after seven weeks of LEGO-based intervention? The research objectives are to evaluate the effectiveness of peer-mediated LEGO-based intervention facilitated by peers in enhancing the social skills of primary school students with ASD in an integrated school located in Kuala Lumpur. To examine the improvement in the social responses and social initiation of primary school students with ASD by participating in a LEGO-based intervention. To analyze the changes in the frequency of peer prompts over seven weeks of attending the LEGO-

based intervention. The following hypotheses will be tested in the current study: 1) Peer-mediated LEGO-based interventions effectively improve social skills for primary school students with ASD. 2) The level of social communication skills of primary school students with ASD increases as a result of LEGO-based intervention. 3) There is a decrease in peer prompts after seven weeks of LEGO-based intervention.

LITERATURE REVIEW

According to Vygotsky's (1978) sociocultural theory, he explains how individuals expand their social interactions with others. In this current study, using Vygotsky's sociocultural theory, it can be demonstrated that the elements of community-based social skills interventions are most likely to be suitable for improving the social skills of individuals with ASD. The zone of proximal development explains that when an individual receives support from an external source, they will be able to proceed beyond their capabilities. Receiving external support must be from a more skilled person or an expert in a specific area. In this study, typically developing peers of children and children with ASD will be working together to build the LEGO model, facilitated by the facilitator. Development in Vygotsky's theory explains the learning aspect in development when an individual learns a new skill or knowledge and applies the knowledge in a different context. For instance, by learning how to initiate conversation during the LEGO intervention, they are most likely to apply the skill at home with their siblings (Vygotsky, 1978).

According to Bandura's social learning theory, children can improve their social learning by observing and modeling a person's behaviors and actions. This helps strengthen their social communication skills, and they will be able to discover new skills and behaviors (Bandura, 1977). Imitation skills are fundamental for children with ASD as they help in developing their cognitive and language skills. However, they lack imitation skills due to their sensory sensitivities and repetitive movements (APA, 2013). Despite having challenges in their imitation skills, they will be able to improve their imitation skills through play. With guidance and support from their educators, they will be able to imitate the sounds, actions, and signs during play with their peers (Bandura, 1989). During play activities, they will learn to observe their peers and enhance their social skills through modeling, turn-taking, learning new play skills, and generalizing the skills learned in other activities. Thus, it can be concluded that social skills interventions should be implemented by including the modeling approach to improving the social communication skills of children with ASD (Akbari et al., 2022).

The LEGO-based intervention has gained support for being a naturalistic approach in terms of providing social skills instructions in contrast to traditional social skills training (Angelis et al., 2024). The skills that are highlighted in LEGO-based intervention are social interaction skills, turn-taking, and learning how to cooperate with others (Angelis et al., 2024). The LEGO bricks are used as a means of communication to enhance their social skills. During the intervention, children are assigned to different roles, and they are expected to collaborate with their peers to complete the final structure facilitated by the teacher. When children with ASD are given clear instructions and an anticipated task, there is a high chance of them initiating conversation with their peers (Narzisi et al., 2021). The LEGO-based intervention has been used with a wide range of populations, including children with ASD, ADHD, and social communication difficulties in schools that enhance their social communication skills (Levy & Dunsmuir, 2020).

A systematic review by Narzisi et al. (2021) of past studies has also found consistent improvement in social skills and collaborative skills from LEGO-based intervention. The strengths of this intervention were that it was convenient and flexible in various settings, such as home, school, and clinical settings (Narzisi et al., 2021). Despite the strengths, there were a few limitations in the studies by Narzisi et al. (2021) in terms of the methodology section. Most of the studies did not include a control group and a conceptual and operational definition of social skills. The lack of a control group makes it difficult to observe any slight improvements in this intervention. The lack of standardized definitions hinders the reliability and generalizability of the study's findings. No fixed number of treatment sessions should be conducted, and the average range was between 3 and 51 hours. This leads to inconsistencies in the duration and frequency of interventions that have been conducted for the intervention. A rating evidence-based scale was not supported, as mentioned by past researchers (Wright et al., 2023).

Interviews, natural observations, and questionnaires were used to measure behaviors, which reduced the study's reliability (Levy & Dunsmuir, 2020).

Peer-mediated LEGO-based intervention demonstrates a promising path to improve the social communication skills of children with ASD, especially in integrated primary school settings. A review of past studies on various social skills interventions found that LEGO-based intervention was one of the most structured, systematic, and suitable for children with ASD, promoting social engagement and peer relationships (Narzisi et al., 2021). This study shows important implications for creating an inclusive environment for children with ASD, as they will have equal opportunities to gain access to education. At the same time, this will also allow the learning among typically developing children to build empathy, understanding, and welcoming qualities towards their peers with ASD. Besides that, this intervention is structured and practical to be facilitated by educators and parents in the children's daily schedule.

METHODOLOGY

This study uses a quantitative and quasi-experimental research approach with a pre-test and post-test design. The independent variable in this study is the participants who participate in the LEGO-based intervention. Participants will participate in this intervention for 7 weeks (about one and a half months). The dependent variable has two levels: pre-intervention assessment and post-intervention assessment (after 7 weeks). This research design creates a positive student environment with the necessary tools for children diagnosed with ASD. This intervention's success will allow schools to support students with ASD by enhancing their social skills and peer interaction.

A non-probability purposive sampling technique will be used to select the participants, as not all individuals in the population will have an equal opportunity to be selected in this study. The ten students for this study were selected based on the inclusion criteria. The inclusion criteria of this study are that the target children should be diagnosed with mild autism spectrum disorder or Asperger's Syndrome before participating in this study. Participants should be aged between 7 to 12 years old and must be diagnosed with high-functioning ASD, mild ASD, or Asperger's syndrome. The exclusion criteria are that children diagnosed with ASD who participate in other social skill interventions will be excluded from this study. Participants without consent from their parents will be excluded from this study. (Levy & Dunsmuir, 2020).

A total of 30 primary school students were elected from an integrated school. The G-Power analysis calculates the sample size of at least 27 samples (Faul et al., 2007). They will attend seven sessions for 20 minutes per session, and everyone who participates in this intervention will receive the same duration and frequency. The participants consist of 20 typically developing peers via random sampling. The remaining ten children will be screened using the Gilliam Autism Rating Scale -3rd Edition (GARS-3) to determine if they fall under high-functioning ASD, mild ASD, or Asperger's syndrome before participating in the study. After screening them, individuals who fit the inclusion criteria will be selected to participate in the study. As for the pilot study, one child with ASD and two typically developing children (one group) will be included. However, this group that participated in the pilot study will be excluded from the final intervention findings.

The participants are from SK Taman Segar, Kuala Lumpur. The permission letter to conduct this intervention was sent to the Ministry of Education, Kementerian Pendidikan Wilayah Persekutuan, before getting approval from the school. After getting approval from the respective departments, the principal of SK Taman Segar was approached to obtain permission to conduct in the school. After providing a detailed explanation of the study, permission was granted by the principal at SK Taman Segar to conduct the research at the school. This integrated school was approved by the Ministry of Education due to the diverse group of students diagnosed with ASD, which aligns with the study's requirements. The school has a structured program and experienced teachers who are suitable and supportive to conduct this study. There will be four facilitators with a Psychology background and experience working with children facilitating the sessions.

The study uses age-appropriate LEGO blocks, four facilitators (Psychology students with experience working with special needs children), and a classroom where the study will be conducted. The age-appropriate LEGO Classic set will be used for this intervention. The LEGO block is the LEGO

Classic 10693, suitable for children aged 4 years old and above. The intervention will be carried out once a week for 20 minutes for 7 weeks (about two months). The room will have two tables with eight chairs for every participant and the facilitator. The LEGO blocks will be placed on the table, and participants must build according to the design provided. The roles of every participant will be changed every week: "engineer," "supplier," and "builder. "The function of an "engineer" is to look at the visual on the kit and instruct the 'builder" to assemble the blocks. The role of the "supplier" is to pay attention to the instructions read by the "engineer," choose the correct blocks, and pass them to the "builder." The role of the "builder" was to assemble the blocks according to the instructions mentioned by the "engineer." The "engineer" only gets to have access to the LEGO instructions (Hu et al., 2018).

The assessment instrument chosen to measure the social skills for this study is the Social Skill Rating System – Parent Version. (SSRS-P; Gresham & Elliot, 1990). The scores are totalled up for each domain; higher scores in each domain indicate better social skills. The SSRS-P instrument has strong internal consistency, ranging from .86 to .90, and good predictive and concurrent validity (Pedersen et al., 2001). The assessment instrument chosen to screen individuals between the ages of three and 22 years old who have autism spectrum disorder for this study is The Gilliam Autism Rating Scale – 3rd Edition (GARS-3; Gilliam, 2013). The questionnaire can be completed by parents, teachers, and caregivers. The scores of each subscale are totalled; higher scores represent a higher severity of ASD in each subscale. The Autism Index is used to measure the severity of individuals with ASD and indicates the support that the individuals need based on their severity. GARS-3 has a strong internal consistency of .93 for subscales and .94 for the Autism Indexes (Samadi et al., 2022).

The social skills behaviours were encrypted using the social behavior coding schedule to measure the social initiations and responses. The duration and frequency of the social interactions were recorded by the facilitators (Bauminger, 2002; Odam & Strain, 1986). As for the fidelity of implementation, it was used to measure the intervention fidelity that will be completed after every session by the researcher via video recording. This is to ensure that all the steps and procedures are executed accordingly throughout the intervention. According to Durlak and DuPre (2008), a fidelity checklist is conducted to improve the accuracy and consistency of the implementation of the intervention by the facilitators.

The Institutional Ethics Committee (IEC) approval was obtained before conducting the study. Once the IEC was approved, the relevant documents were sent to the Ministry of Education (MOE) to obtain approval to conduct the intervention in a government school assigned by MOE. The approval letter must be sent to Kementerian Wilayah Persekutuan to obtain approval to conduct the study in the designated school. The approval letters were submitted to the respective schools to obtain their approval before conducting the study at the school. This study involved the participation of children; informed consent and permission to participate in this study were sent to the parents of participants before the study. The participation of children was voluntary basis. Participants must be included in this study upon the approval and consent of parents. The confidentiality and anonymity of participants' details and data will remain private and confidential throughout the study. To protect the participants' anonymity, a code will be given to all participants. Hence, there is no need to provide the participants' names during the intervention.

Pre-intervention. Before proceeding to the first intervention session, the parents will fill out the Gilliam Autism Rating Scale – 3rd Edition (GARS-3) for all the students diagnosed with ASD. The purpose of this is to collect the screened participants, as only participants with high-functioning ASD, mild ASD, and Asperger syndrome will be included in this study. The parents will then proceed to fill out the Social Skill Rating System – Parent Form (SSRS-P) for all the selected participants after screening. In the first session, the facilitator will introduce himself/herself to the participants. The facilitator then demonstrates the overview of the intervention. The facilitator then reads and explains the group rules and ensures that the participants understand the rules clearly.

Intervention Phase. The following 6 weeks (about one and a half months) will serve as the intervention. Students will be gathering once a week for 20 minutes. Every week, the facilitator will greet the participants and bring them to the intervention place. The facilitator and participants will sit at a table with no other individuals present. The researcher will observe and ensure the session is running smoothly. The LEGO blocks will be presented to the participants, and the rules will be read to them.

The facilitator will assign roles to each participant, and they will switch roles every session. The participants will spend 20 minutes completing the LEGO design. Verbal communication will be encouraged by the facilitator during the intervention. In the last 5 minutes, the facilitator will remind participants to end the construction. Finally, participants will have to clean up the LEGO blocks, and they can be dismissed.

The facilitator will prompt the child to get back to the task if they notice the child was off task for more than 15 seconds. When the facilitator observes that the target child did not answer properly and their peers did not provide any assistance within 10 seconds, the facilitator will provide a verbal prompt to the peers. For example, if the target child was a “builder” and did not answer the “engineer’s” request, the facilitator will verbally prompt the peers who are the “engineer” and "supplier," “You can point to their item or assist the “builder” on what to do next." The facilitator would request for all three children to get back to refer to the documented prompt and go through a discussion on the rules if there is any confusion or disagreement. However, if the child engages in problem behavior or is not compliant with other peers for more than 5 minutes, the intervention will be terminated immediately (Hu et al., 2018). Each session lasts approximately 20 minutes, and the data will be collected and assessed using the social behavior coding scheme. The facilitators will be asked to video-record the sessions so that the researcher can execute the fidelity checks.

Post-Intervention. During the last week of intervention, parents will have to fill up the Social Skill Rating System – Parent Form (SSRS-P) of participants with ASD who are the target participants.

The paired sample t-test, which includes descriptive statistics, will be used to assess the scores of the dependent variable, which is social skills. As for the analysis of the measurements, SPSS software was used for all statistical analyses. Cohen’s d was used to determine the standardized mean differences, confidence intervals, standard errors, and effect sizes. Descriptive statistics are used to measure the mean, mode, median, range, and standard deviation of the scores of independent and dependent variables. A paired-sample t-test is used to measure the scores of the dependent variable across two time points. This statistical test is used when there are the same participants in all groups.

RESULTS AND FINDINGS

The research aimed to examine the effectiveness of LEGO-based therapy facilitated by peers in effectively enhancing social skills, especially social initiations and social responses, among primary school students diagnosed with ASD. The pre-intervention and post-intervention of the social initiations and social responses were measured using a social behavior coding scheme. The data on social initiations and social responses were analyzed, and it was observed that there was a significant improvement in both social behaviors of children with ASD. During pre-intervention, a limited social initiation was followed by most participants. They had difficulties adapting to the new environment, engaging with typically developing peers, and initiating conversation. However, there was an increase in social behavior across seven weeks.

During the fourth week, the frequency of verbal and nonverbal social responses and initiations increased. The video recording observed that the social initiations in terms of eye contact and turn-taking by the children with ASD had increased tremendously. The participants showed a gradual increase in social initiations across seven weeks by asking for the LEGO blocks, pointing at the LEGO blocks that they needed, and holding their peers’ hands to ask for assistance. The statistical analyses revealed a significant increase in mean scores of social initiations from pre-intervention to post-intervention (M =4.78, SD =5.52 pre-intervention to M =6.22, SD = 3.11 post-intervention) (refer to Table 1).

Table 1: Pre- and Post-intervention of Social Initiation

		Mean	**N**	**Std. Deviation**	**Std. Error Mean**
Pair 1	pre_social initiation	4.78	9	5.518	1.839
	post_social initiation	6.22	9	3.114	1.038

As for social responses, participants showed a significant increase in terms of verbal and non-verbal social responses. The participants showed an increase in verbal social responses, such as "here you go" and "this," and showed an increase in non-verbal social responses, such as nodding their heads, pointing at the blocks, and eye contact. The statistical analyses showed a significant increase in mean scores from pre-intervention to post-intervention (M =16.89, SD =9.77 pre-intervention to M =23.78, SD = 7.38 post-intervention) (refer to Table 2).

Table 2: Pre- and Post-intervention of Social Responses

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	pre_social response	16.89	9	9.765	3.255
	post_social response	23.78	9	7.379	2.460

A paired samples t-test was conducted to compare the social skills of primary school students with ASD pre-intervention and post-intervention of attending the LEGO-based intervention. The research consists of nine primary school students diagnosed with ASD. The social skills of the students were measured using the Social Skill Rating System – Parent Form (SSRS-P) before (pre-test) and after (post-test) intervention. The statistical analyses showed a significant increase in mean scores of social skills from pre-intervention to post-intervention (M =34.56, SD =16.92 pre-intervention to M =38.89, SD = 16.93 post-intervention) (refer to Table 2). This shows an increase in the mean scores of social skills by 4.33, demonstrating that LEGO-based intervention enhances social engagement and collaboration skills in children with ASD.

The Shapiro-Wilk test was used to assess the normality of pre-intervention, W =0.88, p = 0.17, and post-intervention, W = 0.91, p = 0.30. and the results showed the data was normally distributed. Thus, it can be concluded that the normality for the paired sample t-test was met (refer to Table 3). A paired samples t-test showed that the participant's level of social skills increased from pre-intervention (M = 34.56, SD = 16.92) to post-intervention (M = 38.89, SD = 16.93; t = -2.64, p =.030) (refer to table 5). The results show that there was a statistically significant increase in the level of social skills, as the p-value was less than 0.05.

Table 3: Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre-intervention social skills	.162	9	.200*	.883	9	.168
Post-intervention social skills	.228	9	.195	.908	9	.300

*. This is a lower bound of true significance.

Table 4: Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Social skills	34.56	9	16.920	5.640
	Social skills	38.89	9	16.930	5.643

Table 5: Paired Samples Test

		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				One-Sided p	Two-Sided p
					Lower	Upper				
Pair 1	Social skills	-4.333	4.924	1.641	-8.119	-.548	-2.640	8	.015	.030

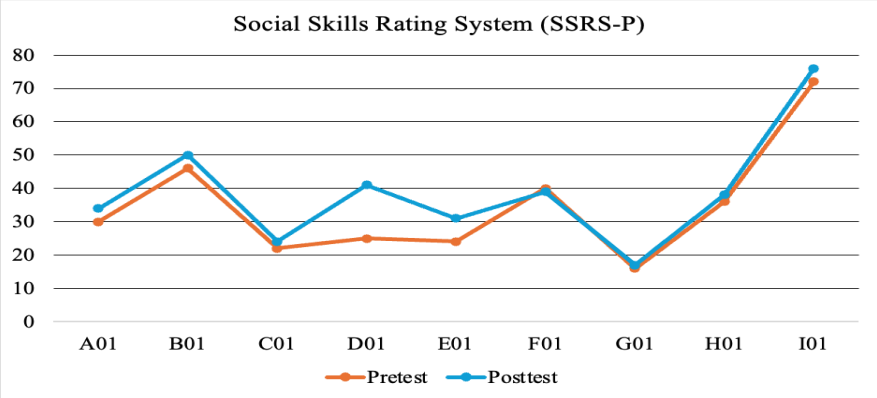

Figure 1: Changes in Social Skills during Pre- and Post-Intervention

The results show that there is a slight decrease in the number of peer prompts for most of the target participants after seven weeks of LEGO-based intervention. The prompts, cues, and assistance have been slightly reduced compared to the first week of intervention (referring to Figure 2). This slight decrease indicates that children with ASD attempt to be more independent in interacting with their peers and completing the LEGO design. They needed fewer prompts from their typically developing peers to complete the LEGO design. As for participants A, F, and H, the peer prompts increased due to external factors such as having behavior during the intervention, lack of sleep, which affected their performance, and a change in roles as they wanted to be the builder instead of the supplier. This affected their performance, which is why their peers had to provide extra support for them.

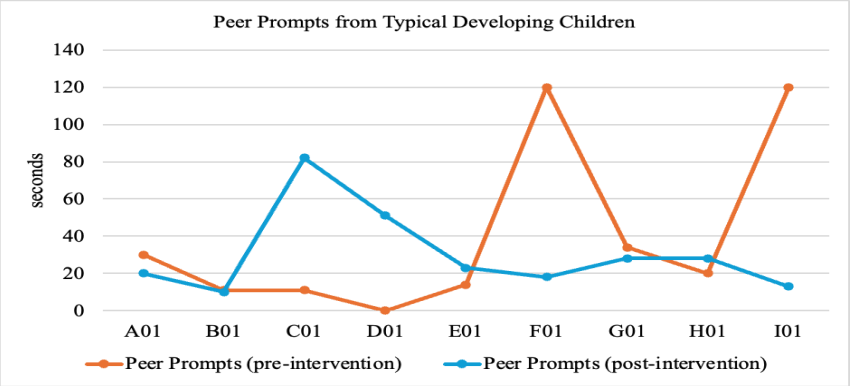

Figure 2: Changes in Peer Prompts during Pre- and Post-Intervention

The findings of the study show that peer-mediated LEGO-based intervention significantly improves the social skills of primary school students with ASD. To support this statement, there was an increase in social interactions, which included social initiation and social response measured using the social behavior coding scheme. An increase in social interactions was observed in week 3 onwards. In addition, there were communication skills observed by the facilitators during the intervention, such as maintaining eye contact and turn-taking. In comparison to the pre-intervention and post-intervention, the student with ASD is comfortable participating in a structured and inclusive environment, which helps enhance their social interactions. In summary, the peer-mediated LEGO-based intervention is a promising and effective approach to improving the social skills of primary students with ASD.

DISCUSSIONS, RECOMMENDATIONS, AND CONCLUSIONS

The findings showed that there was a positive increase in the level of social skills using peer-mediated LEGO-based intervention as a medium. The mean scores of social skills increased across the seven weeks of intervention, which indicates that there is an improvement in the social interaction of children with ASD. The results of the paired-sample t-test showed that the changes in social skills were statistically significant. The changes in social skills are statistically significant; the increase in mean scores indicates that peer-mediated LEGO-based intervention has practical effectiveness in improving the social skills of children with ASD. The findings of this study add to the growing evidence of LEGO-based intervention in improving the social skills of children with ASD. The results align with the hypothesis that peer-mediated LEGO-based intervention effectively enhances the social skills of primary school students with ASD. The findings support past studies showing a significant improvement in social behavior in children aged five to eight years (Angelis et al., 2024).

As for social interactions, the findings showed that there is an increase in social initiations and social responses in children with ASD in post-intervention compared to pre-intervention. During week 4 onwards, there was an increase in social initiations with typically developing peers when requesting LEGO blocks, initiating peers to find the correct LEGO block, and checking with peers if they are fixing the LEGO block correctly. As for the social responses, there was an increase in them as well when responding to peers' questions and following the instructions provided by peers to build the LEGO blocks. The nature of LEGO-based intervention has a great impact on the child's turn-taking skills, joint attention, problem-solving, and social communication skills (Zhang et al., 2022). These findings can be supported by past research that focused on how LEGO-based intervention provides opportunities for enhancing social skills over time. It is shown that when typically developing children work together with primary school students with ASD on completing a shared goal, which is fixing the LEGO blocks, they can cooperate and communicate to achieve the goal (Zhang et al., 2022).

The findings showed a slight decrease in the peer prompts after attending seven weeks of peer-mediated LEGO-based intervention. Peer prompts include verbal and non-verbal prompts provided by typically developing peers, such as gesture prompts, verbal prompts, and physical prompts. Peer prompts also include social praise and words of encouragement by typically developing children to the children with ASD in maintaining interactions during the intervention. The decrease in peer prompts

shows that children with ASD are less dependent on prompts from typically developing children to engage in social interactions (Zhang et al., 2022). The factors that contributed to the decrease in peer prompts could be due to the structured environment, which reflected the success of the LEGO-based intervention, which enhanced the social interactions (Wright et al., 2023). Several aspects might have contributed to the decrease in peer prompts, which are social skill development, familiarity with peers, and the effectiveness of peer support. Over the seven intervention weeks, the target participants developed their social initiations and social responses with minimal delays and prompts. They became familiar and comfortable with the typical developing children over the seven weeks, which reduced the external motivation and encouragement from peers. The structure of peer-mediated LEGO-based intervention was very structured, and it required teamwork, which encouraged the participants to work together and rely on each other's support to complete the design (Zhang et al., 2022).

The increase in social skills demonstrates that peer-mediated LEGO-based intervention is an effective tool for improving social skills in children with ASD. The structured and systematic environment helps children with ASD improve their social initiations and responses, enhancing their social interactions with peers. This approach also helps collaborate during group activities in school, such as sports and class activities. Students with ASD will also improve their turn-taking skills. Joint attention and communication skills during group activities (Bambara et al., 2021). Schools and teachers play an important role in implementing the LEGO-based intervention as part of their social skills program, as it has been shown that this approach increases the social interactions of students with ASD. This can be implemented as an extracurricular activity for children with ASD, involving the typically developing students as well. This can be a steppingstone to creating an inclusive environment and, at the same time, enhancing the social skills of students with ASD (Bambara et al., 2021).

The decrease in peer prompts from typically developing children shows that there is the possibility that students with ASD will interact with others independently. This suggests that peer-mediated interventions are a great medium to enhance the social interactions of children with ASD in a natural way, instead of forcing interaction with them. It highlights the importance of gradually fading the peer prompts to promote the independent social skills of primary school students diagnosed with ASD. By decreasing the peer prompts, students diagnosed with ASD will have the opportunity to gain self-confidence and competence instead of relying on their peers throughout the intervention. The skills learned in this intervention can be generalized to different settings, such as home, family gatherings, and playgrounds. However, parents play an important role in ensuring that they know the group rules, provide an environment conducive to conducting the intervention, and encourage social interactions during the intervention (Hu et al., 2018).

RECOMMENDATIONS

There are a few recommendations suggested to improve future studies on peer-mediated LEGO-based interventions in enhancing the social skills of primary school students with ASD. The first recommendation would be to expand the sample scope. Future research should collect data from various Integrated Special Education Programs (PPKI) in terms of different states and age ranges. This helps in collecting more diverse data that can provide a comprehensive report on the school's educational practice, resources provided to students, and equipment used when working with the students.

In regard to that, the sample size of the data should be increased as the current study recruited ten students from one PPKI school. This recommendation can only be made with the help of schoolteachers, students, parents, and volunteers. This is because there were many challenges faced when getting approval from the Ministry of Education, consent from students' parents, and recruitment of volunteers due to availability. Some students were absent during the intervention, which made it more challenging to examine the intervention outcomes. There was a lack of follow-up sessions to examine whether the skill was maintained. This is because there was a time constraint due to the duration of getting approval from the respective departments. Future research needs to do a follow-up session to examine the maintenance of the skills of the intervention.

The next recommendation for future research would be to extend the duration of the intervention. The main purpose of an intervention is to track the changes before and after the intervention. It is highly recommended to conduct the intervention for at least eight to twelve weeks to

observe the long-term effects of the intervention. By extending the period of intervention, it helps to record the changes and improvements in the social skills of the students. However, researchers should also take note of the duration needed to obtain approval from the Ministry of Education (MOE), as it took one month to obtain approval from the MOE and the school. It is important to prepare a research timeline and plan the entire preparation and execution stage to minimize any delays.

Future researchers should ensure that the schools provide a conducive intervention environment. To ensure a conducive venue is provided, researchers should communicate clearly with the principal and teachers in charge. During the first session, the venue was not conducive, distracting the participants during the intervention. Thus, researchers need to communicate and explain the importance of having a conducive environment so that the intervention can be conducted smoothly without any distractions. In addition to that, the inclusion criteria should also be explained to the teachers and principal to avoid any misunderstanding.

The following recommendation would be for the government school to collaborate with non-government organizations (NGOs) to provide resources, such as LEGO blocks, to implement the LEGO-based intervention. This is because the school principal mentioned that they do not have the resources and require sufficient funds to buy the materials needed for this intervention. Upon completion of the intervention, two classic LEGO blocks were contributed to the school for them to practice the intervention. The school can collaborate with NGOs to create a classroom for the intervention or any social skills activities to avoid any disruptions, such as loud noises. Funds can be allocated to hire and train teachers to facilitate the LEGO-based intervention. The educators can be trained and evaluated by a LEGO practitioner to evaluate the effectiveness of the intervention on children's social skills. By doing so, the teachers would be able to engage with the parents by updating the child's progress. Parents can also take this opportunity to reinforce their child's social skills at home through social skill activities.

CONCLUSIONS

There are limitations in my study, whereby I only focused on one integrated primary school in Kuala Lumpur, which might impact the generalizability of my results. One integrated school was chosen, which is located at SK Taman Segar, Kuala Lumpur, due to the time required to obtain approval from the Ministry of Education. This limitation might affect the diversity of the data and educational practices across different integrated schools. The educational practices and experiences working with children with ASD might differ across different schools. Thus, the results might not generalize the educational practices or educational settings. The study's sample size is also constrained due to the availability of children diagnosed with ASD. This is because some of them were frequently absent during the intervention, which reduced the effective sample size and potentially influenced the reliability of the results. The intervention required consistent participation to accurately measure the progress, and the absence of a few students compromised the ability to evaluate the outcomes comprehensively.

This limitation could affect the findings of this study as it limits the ability to draw broader conclusions in terms of the individual's educational needs or responses to interventions. There was another limitation whereby the study had to be shortened to 7 weeks due to a shortage of time. This is because the approval from the Ministry of Education and Kementerian Pendidikan Wilayah Persekutuan took a month, which delayed the process. To understand the progress of individuals with ASD in terms of their social skills, it is important to observe the long-term effects for at least 8 to 10 weeks to capture the changes in social development of children with ASD. This limitation might have affected the results of this study due to the challenge of capturing important changes in their social skills.

Another potential limitation in this study is the method of peer selection. While the children with ASD were selected based on inclusion criteria, the typically developing children were chosen based on the teacher's recommendation instead of random assignment. This approach might have a potential risk of selection bias, as teachers are more likely to nominate students who are more socially competent and cooperative. These participants might possess good social skills, which could influence the outcomes of the intervention. Future research should consider random peer selection or apply standardized peer inclusion criteria to minimize the bias and ensure more objective findings.

Besides that, this intervention is conducted in a government school, which limits the follow-up and generalization. This is because the Ministry of Education only approved the study to be conducted for 3 months, and if the research needs to be extended, another approval should be acquired with a valid reason. It is important to follow up on the student's progress after the post-intervention to ensure that the skills are maintained and generalized in other settings. The skills that are learned during the intervention at school might not be generalized in another setting unless the intervention is followed up 3-6 months after the post-intervention. This limitation might affect the skills learned during the intervention, as the skills might not be sustained if not followed up.

The involvement of typically developing peers is an important factor in contributing to the development of social skills in children with ASD (Aldabas, 2019). They act as a social role model for children with ASD, as they can observe and model the appropriate social behaviors and, simultaneously, receive praise and feedback from typically developing children. School teachers need to educate the typically developing children about showing empathy and understanding the challenges of special needs children. By educating them about empathy and inclusivity it helps to build meaningful relationships with children with ASD. Schools can take this opportunity to conduct peer-led social skills activities that promote interactions between children with ASD and typically developing children to improve their learning (Aldabas, 2019). LEGO is used as a tool for the intervention, which contributes to an engaging and systematic environment for children with ASD. This approach creates a positive environment to develop the social skills of children with ASD. The LEGO-based intervention creates a low-pressure setting that reduces stress and anxiety, unlike traditional therapies (Angelis et al., 2024).

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APPENDICES

Appendix A: Social Skill Rating System – Parent Form (SSRS-P)

SSRS-P items

Read each item 1-52 and think about your child's present behavior. Decide how often your child does the behavior described.
If your child never does this behavior, circle the O.
If your child sometimes does this behavior, circle the 1.
If your child very often does this behavior, circle the 2.

For items 1-40, you should also rate how important each of these behaviors is for your child's development.
If it is not important for your child's development, circle the O.
If it is important for your child's development, circle the 1.
If it is critical for your child's development, circle the 2.

No.	Present behaviour	0 (Never)/ 0 (not important)	1 (Sometimes)/ 1 (Important)	2 (very often)/ 2 (very important)
1.	Starts conversations rather than waiting for others to talk first.			
2.	Helps you with household tasks without being told.			
3.	Attempts household tasks before asking for your help.			
4.	Participates in organized activities such as sports or clubs.			
5.	Politely refuses unreasonable requests from others.			
6.	Introduces himself or herself to new people without being told.			
7.	Uses free time at home in an acceptable way.			

continued

8.	Says nice things about himself or herself when appropriate.			
9.	Responds appropriately to teasing from friends or relatives of his or her own age.			
10.	Responds appropriately when hit or pushed by other children.			
11.	Volunteers to help family members with tasks.			
12.	Invite others to your home.			
13.	Avoids situations that are likely to result in trouble.			
14.	Makes friends easily.			
15.	Keeps room clean and neat without being reminded.			
16.	Completes household tasks within a reasonable time.			
17.	Shows concern for friends and relatives of his or her age.			
18.	Controls temper in conflict situations with you.			
19.	Ends disagreements with you calmly.			
20.	Speaks in an appropriate tone of voice at home.			
21.	Acknowledges compliments or praise from friends.			

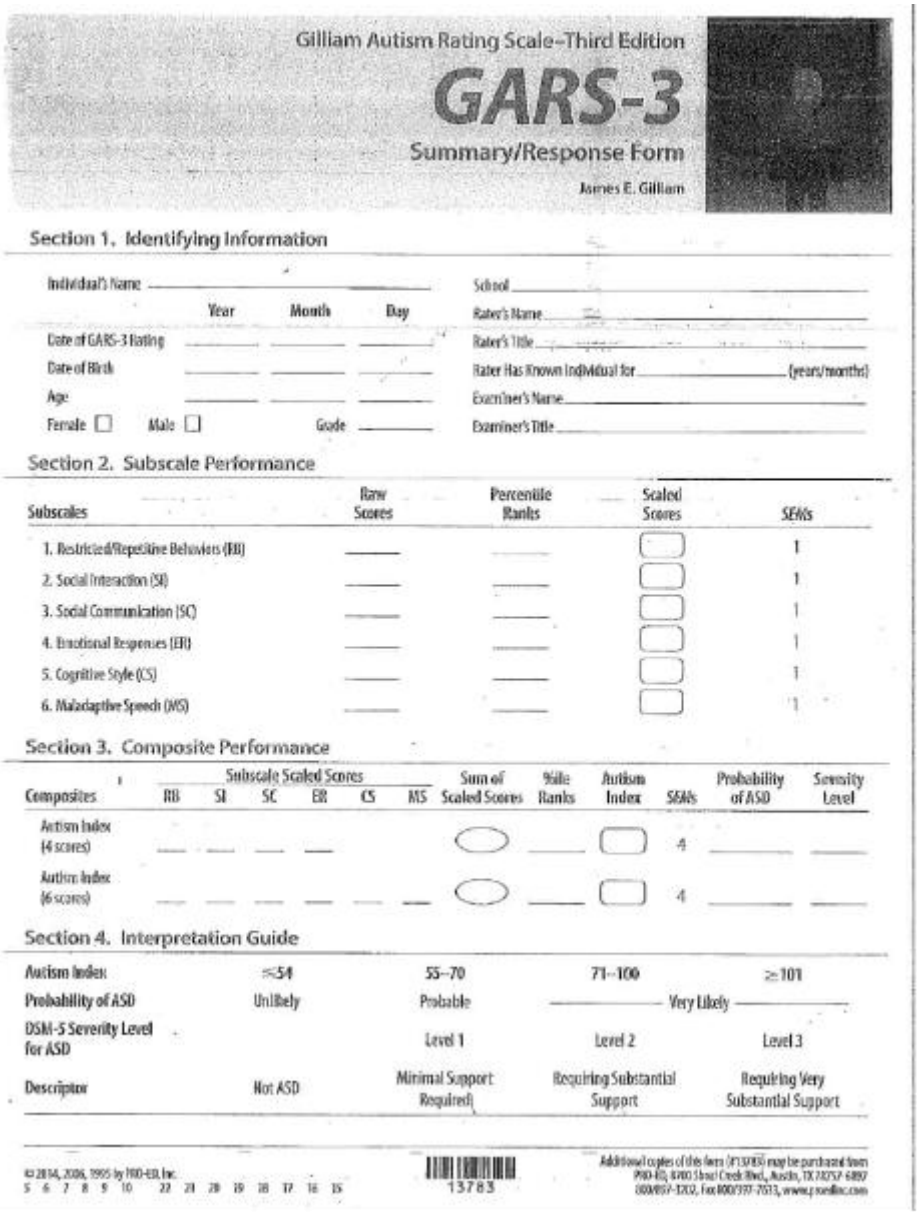
continued

22.	Controls temper when arguing with other children.			
23.	Appropriately expresses feelings when wronged.			
24.	Follows the rules when playing games with others.			
25.	Attends to your instructions.			
26.	Joins group activities without being told to.			
27.	Compromises in conflict situations by changing one's own ideas to reach an agreement.			
28.	Puts away belongings or other household property.			
29.	Waits turn in games or other activities.			
30.	Uses time appropriately while waiting for your help with homework or some other task.			
31.	Receives criticism well.			
32.	Informs you before going out with friends.			
33.	Follows household rules.			
34.	Is self-confident in social situations such as parties or group outings.			
35.	Shows interest in a variety of things.			
36.	Reports accidents to appropriate persons.			

continued

37.	Is liked by others.			
38.	Answers the phone appropriately.			
39.	Asks sales clerks for information or assistance.			
40.	Appears self-confident in social interactions with opposite-sex friends.			
41.	Likes to be alone.			
42.	Fights with others.			
43.	Is easily embarrassed.			
44.	Argues with others.			
45.	Threatens or bullies others.			
46.	Talks back to adults when corrected.			
47.	Has temper tantrums.			
48.	Appears lonely.			
49.	Gets angry easily.			
50.	Shows anxiety about being with a group of children.			
51.	Acts sad or depressed.			
52.	Has low self-esteem.			

Appendix B: Gilliam Autism Rating Scale – 3rd Edition (GARS-3)



Gilliam Autism Rating Scale–Third Edition

GARS-3

Summary/Response Form

James E. Gilliam

Section 1. Identifying Information

Individual's Name _____ School _____

Year Month Day Rater's Name _____

Date of GARS-3 Rating _____ _____ _____ Rater's Title _____

Date of Birth _____ _____ _____ Rater Has Known Individual for _____ (years/months)

Age _____ _____ _____ Examiner's Name _____

Female ☐ Male ☐ Grade _____ Examiner's Title _____

Section 2. Subscale Performance

Subscales	Raw Scores	Percentile Ranks	Scaled Scores	SEMs
1. Restricted/Repetitive Behaviors (RB)				1
2. Social Interaction (SI)				1
3. Social Communication (SC)				1
4. Emotional Responses (ER)				1
5. Cognitive Style (CS)				1
6. Maladaptive Speech (MS)				1

Section 3. Composite Performance

Composites	Subscale Scaled Scores RB	SI	SC	ER	CS	MS	Sum of Scaled Scores	%ile Ranks	Autism Index	SEMs	Probability of ASD	Severity Level
Autism Index (4 scores)										4		
Autism Index (6 scores)										4		

Section 4. Interpretation Guide

Autism Index:	≤54	55–70	71–100	≥101
Probability of ASD	Unlikely	Probable	Very Likely	
DSM-5 Severity Level for ASD		Level 1	Level 2	Level 3
Descriptor	Not ASD	Minimal Support Required	Requiring Substantial Support	Requiring Very Substantial Support

13783

continued

Section 5: Ratings

Directions: On a scale of 0 to 3, rate the following items in terms of how adequately the item describes the individual's behavior. Circle the number that best describes your observations of the person's typical behavior under ordinary circumstances (i.e., in most places, with people he or she is familiar with, and in usual daily activities). Remember to rate every item. If you are uncertain about how to rate an item, delay the rating and observe the person for a 6-hour period to determine your rating.

0 Not at all like the individual
1 Not much like the individual
2 Somewhat like the individual
3 Very much like the individual

PLEASE RATE EVERY ITEM

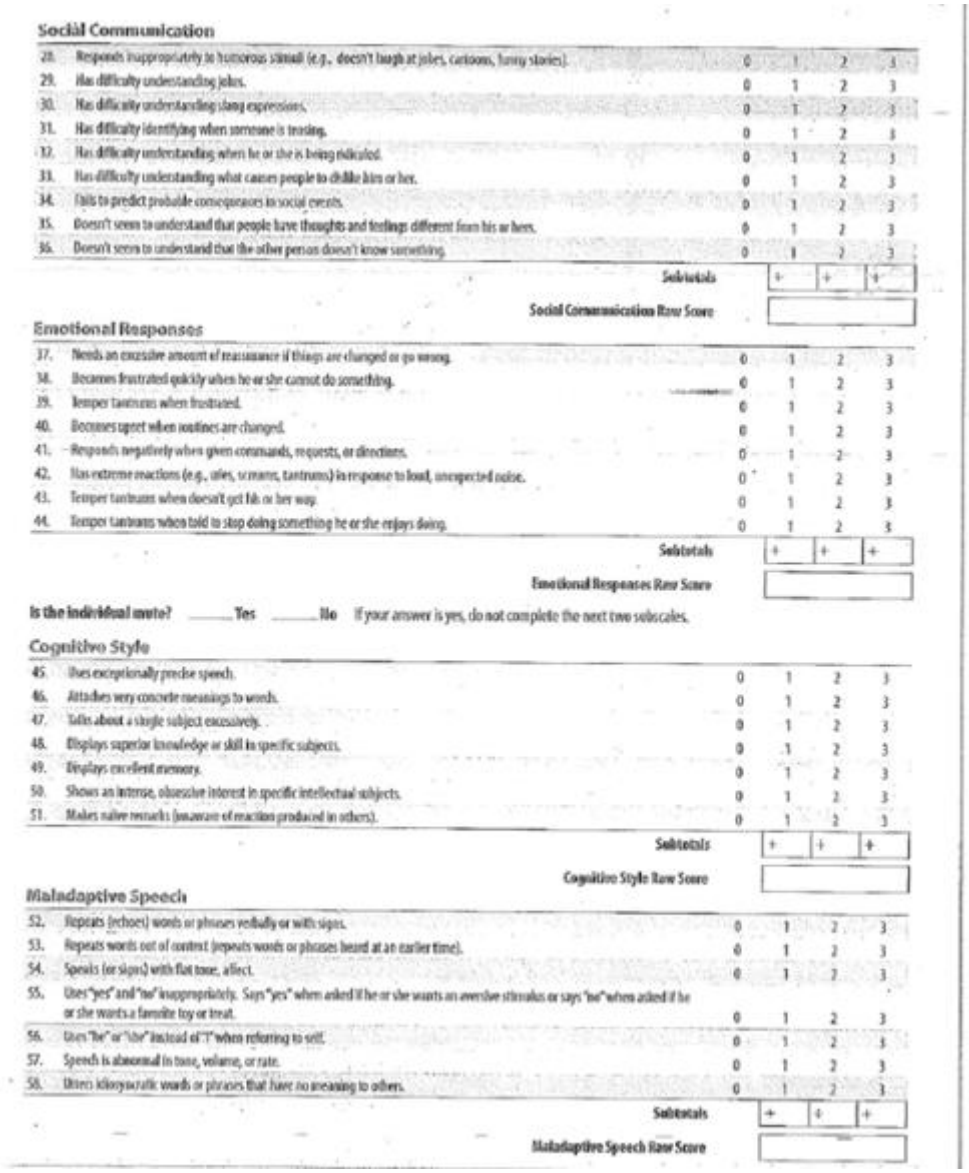
Restricted/Repetitive Behaviors

1.	If left alone, the majority of the individual's time will be spent in repetitive or stereotyped behaviors.	0	1	2	3
2.	Is preoccupied with specific stimuli that are abnormal in intensity.	0	1	2	3
3.	Stares at hands, objects, or items in the environment for at least 5 seconds.	0	1	2	3
4.	Flicks fingers rapidly in front of eyes for periods of 5 seconds or more.	0	1	2	3
5.	Makes rapid lunging, darting movements when moving from place to place.	0	1	2	3
6.	Flaps hands or fingers in front of face or at sides.	0	1	2	3
7.	Makes high-pitched sounds (e.g., eee-eee-eee-eee) or other vocalizations for self-stimulation.	0	1	2	3
8.	Uses toys or objects inappropriately (e.g., spins cars, takes action toys apart).	0	1	2	3
9.	Does certain things repetitively, ritualistically.	0	1	2	3
10.	Engages in stereotyped behaviors when playing with toys or objects.	0	1	2	3
11.	Repeats unintelligible sounds (babbles) over and over.	0	1	2	3
12.	Shows unusual interest in sensory aspects of play materials, body parts, or objects.	0	1	2	3
13.	Displays ritualistic or compulsive behaviors.	0	1	2	3
	Subtotals		+	+	+
	Restricted/Repetitive Behaviors Raw Score				

Social Interaction

14.	Does not initiate conversations with peers or others.	0	1	2	3
15.	Pays little or no attention to what peers are doing.	0	1	2	3
16.	Fails to imitate other people in games or learning activities.	0	1	2	3
17.	Doesn't follow other's gestures (cues) to look at something (e.g., when other person nods head, points, or uses other body language cues).	0	1	2	3
18.	Seems indifferent to other person's attention (doesn't try to get, maintain, or direct the other person's attention).	0	1	2	3
19.	Shows minimal expressed pleasure when interacting with others.	0	1	2	3
20.	Displays little or no excitement in showing toys or objects to others.	0	1	2	3
21.	Seems uninterested in pointing out things in the environment to others.	0	1	2	3
22.	Seems unwilling or reluctant to get others to interact with him or her.	0	1	2	3
23.	Shows minimal or no response when others attempt to interact with him or her.	0	1	2	3
24.	Displays little or no reciprocal social communication (e.g., doesn't voluntarily say "bye-bye" in response to another person saying "bye-bye" to him or her).	0	1	2	3
25.	Doesn't try to make friends with other people.	0	1	2	3
26.	Fails to engage in creative, imaginative play.	0	1	2	3
27.	Shows little or no interest in other people.	0	1	2	3
	Subtotals		+	+	+
	Social Interaction Raw Score				

continued



Social Communication

28.	Responds inappropriately to humorous stimuli (e.g., doesn't laugh at jokes, cartoons, funny stories).	0	1	2	3
29.	Has difficulty understanding jokes.	0	1	2	3
30.	Has difficulty understanding slang expressions.	0	1	2	3
31.	Has difficulty identifying when someone is teasing.	0	1	2	3
32.	Has difficulty understanding when he or she is being ridiculed.	0	1	2	3
33.	Has difficulty understanding what causes people to dislike him or her.	0	1	2	3
34.	Fails to predict probable consequences in social events.	0	1	2	3
35.	Doesn't seem to understand that people have thoughts and feelings different from his or hers.	0	1	2	3
36.	Doesn't seem to understand that the other person doesn't know something.	0	1	2	3
	Subtotals		+	+	+
	Social Communication Raw Score				

Emotional Responses

37.	Needs an excessive amount of reassurance if things are changed or go wrong.	0	1	2	3
38.	Becomes frustrated quickly when he or she cannot do something.	0	1	2	3
39.	Temper tantrums when frustrated.	0	1	2	3
40.	Becomes upset when routines are changed.	0	1	2	3
41.	Responds negatively when given commands, requests, or directions.	0	1	2	3
42.	Has extreme reactions (e.g., rules, screams, tantrums) to response to loud, unexpected noise.	0	1	2	3
43.	Temper tantrums when doesn't get his or her way.	0	1	2	3
44.	Temper tantrums when told to stop doing something he or she enjoys doing.	0	1	2	3
	Subtotals		+	+	+
	Emotional Responses Raw Score				

Is the individual mute? _____ **Yes** _____ **No** If your answer is yes, do not complete the next two subscales.

Cognitive Style

45.	Uses exceptionally precise speech.	0	1	2	3
46.	Attaches very concrete meanings to words.	0	1	2	3
47.	Talks about a single subject excessively.	0	1	2	3
48.	Displays superior knowledge or skill in specific subjects.	0	1	2	3
49.	Displays excellent memory.	0	1	2	3
50.	Shows an intense, obsessive interest in specific intellectual subjects.	0	1	2	3
51.	Makes naïve remarks (unaware of reaction produced in others).	0	1	2	3
	Subtotals		+	+	+
	Cognitive Style Raw Score				

Maladaptive Speech

52.	Repeats (echoes) words or phrases verbally or with signs.	0	1	2	3
53.	Repeats words out of context (repeats words or phrases heard at an earlier time).	0	1	2	3
54.	Speaks (or signs) with flat tone, affect.	0	1	2	3
55.	Uses "yes" and "no" inappropriately. Says "yes" when asked if he or she wants an aversive stimulus or says "no" when asked if he or she wants a favorite toy or treat.	0	1	2	3
56.	Uses "he" or "she" instead of "I" when referring to self.	0	1	2	3
57.	Speech is abnormal in tone, volume, or rate.	0	1	2	3
58.	Utters idiosyncratic words or phrases that have no meaning to others.	0	1	2	3
	Subtotals		+	+	+
	Maladaptive Speech Raw Score				

continued

Section 6: GARS-3 Characteristics

Description: *The Gilliam Autism Rating Scale—Third Edition* is a standardized instrument designed for assessment of persons who have autism spectrum disorder (ASD) and other severe behavioral disorders. The GARS-3 provides norm-referenced information that can assist in the diagnosis of ASD.

Item Selection: Items on the GARS-3 are based on the DSM-5 diagnostic criteria for ASD, adopted by the American Psychiatric Association in 2013.

Normative Data: The GARS-3 was standardized on a sample of 1,859 individuals with ASD from 47 states and the District of Columbia.

Reliability: Internal consistency of the GARS-3 was determined using Cronbach's alpha technique. Studies revealed average coefficient alphas of .90 for Restricted/Repetitive Behaviors, .94 for Social Interaction, .89 for Social Communication, .90 for Emotional Responses, .86 for Cognitive Style, .79 for Maladaptive Speech, .94 for Autism Index 4, and .93 for Autism Index 6. These reliability coefficients indicate that the items within the subscales are consistent in the measurement of characteristic behaviors of persons with ASD and other serious behavioral disorders. All of the items are sufficiently reliable for contributing to important diagnostic decisions.

Validity: The validity of the GARS-3 was demonstrated through several research studies. Item analysis established that GARS-3 subscale items are consistent and discriminative. Criterion-prediction validity studies indicate that the GARS-3 is a highly accurate predictor of autism. Construct-identification validity studies provide strong evidence for the structure of the GARS-3. One may conclude that the GARS-3 is a valid measure of autism spectrum disorder, particularly of those behaviors that are identified in DSM-5, and that examiners can use the scale with confidence.

Appendix C: Social Behavior Coding Scheme

Participant (Code): Session Number (Week):

For duration: Record the seconds of interactions per 20-minute session.

	Duration in seconds
Child-initiated social interaction	
Peer initiated social interaction	

For frequency: Follow the interval sampling procedure below.

Minute	**15 second Interval**			
	15 secs	30secs	45 secs	60secs
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				