# Promoting the Social Skills of Adolescents With Autism Spectrum Disorder (ASD) With the Use of a Peer Network Intervention

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*The purpose of this study is to investigate the effects of a peer network individualized intervention toward improving the social skills of three middle school high-functioning adolescents with autism spectrum disorder (ASD) without intellectual disability (ID). The intervention was based on the Circle Time program (Mosley & Tew, 2013), and it was carried out in 10 weeks and in three separate groups of students, with each group consisting of nine participants: one adolescent with ASD and eight non-labeled classmates. We used a multiple-baseline-across-participants experimental design to assess the effectiveness of the intervention and generalization to novel responses and settings. The results of the present study revealed that the social skills of all three participants increased and generalized to an unstructured setting, namely in the playground, during recess time, and in unfamiliar areas that students visited during school excursions. Our findings replicate prior work on individualized interventions that help children with ASD improve and generalize newly acquired social skills in school settings. Enhancing social skills of the aforementioned adolescents may limit the possibility of behavioral and emotional problems which can lead to further learning difficulties and may help them fulfill their potential.*

*Keywords:* **ASD, High Functioning, Adolescents, Social Skills, Learning Problems, Peer Network Intervention**

## INTRODUCTION

Miller and Ingham (1976) stated that friendship is a protective factor against stress and correlates positively with self-esteem and negatively with depression (Buhrmester, 1990). In addition, adolescents state that friends are the most impor-

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tant factor contributing to their quality of life (Helseth & Misvær, 2010). For middle school students with mild forms of autism spectrum disorder (ASD), socialization deficits are a "major source of impairment regardless of cognitive or language ability" (Carter et al., 2005, p. 320).

Adolescents with ASD, even those who require minimal support, may have difficulty in various social and language skills, such as making eye contact, greeting, starting a conversation with peers, demonstrating appropriate affect, interpreting nonverbal cues, and other skills that all contribute to problems in reciprocal interactions (Paul et al., 2009; Weiss & Harris, 2001). In addition, they have difficulty interpreting nonliteral language, such as sarcasm, metaphor, and humor (Krasny et al., 2003; Shaked & Yirmiya, 2003; Tager-Flusberg, 2003) and often exhibit inappropriate responses due to high levels of physiological arousal (Bellini, 2006). Despite the fact that adolescents with mild forms of ASD have the aforementioned deficits, their language and cognitive skills may be intact, which differentiates them from people with ASD who require great support (Attwood, 1997; Frith, 1991; Grandin, 2008; Sansosti & Powell-Smith, 2008; Sigman & Capps, 1997). Their academic deficits become more obvious when they attend middle school where they have to cope with abstract learning, critical thinking, verbal reasoning, linguistically complex passages, problem solving and advanced reading and listening comprehension.

What appears to be a paradox is the fact that the inclusion of middle school students with mild forms of ASD in general education school contexts has failed to increase their interactions with their typically developing peers. Studies have shown that the frequency of the ASD students' social interactions is reduced when they are included in general education schools without receiving help on how to improve their social skills (Evans et al., 1992). Furthermore, they often feel isolated and are bullied more often than their peers without disabilities or even their peers with learning difficulties (Humphrey & Symes, 2010; Twyman et al., 2010). In fact, they are bullied four times more than the general student population (Miller & McGonigle-Chalmers, 2014). It goes without saying that the increased percentages of bullying victimization, combined with loneliness, have a negative impact on the mental health of these students, whose deficits cannot be perceived by their typically developing peers. As a consequence, they experience more emotional or behavioral problems compared to their typically developed peers (Mazzucchelli et al., 2018). These possible emotional and behavioral problems combined with their deficits may have negative impact on their learning skills. Prevention of learning difficulties for adolescents with ASD is of cardinal importance mostly because the specific adolescents have the potential to graduate and become contributing members of society. The need, therefore, to improve the social skills of adolescents with ASD becomes imperative.

In the past decade, there has been growing emphasis on the development of intervention programs aiming to enhance the social skills of adolescents with mild forms of ASD (Reichow et al., 2013). Nevertheless, most of those intervention programs have been conducted with children (Chan et al., 2009; Chang & Locke, 2016; Kasari et al., 2012; Ramdoss et al., 2011). In fact, there are very few relevant studies that aim to address the social needs of adolescents with ASD, especially studies conducted in their schools (Koegel et al., 2012; Koegel et al., 2013; Laugeson et al., 2014;

Sreckovic et al., 2017). Generally, the few documented intervention programs were group-based, peer-mediated, and, to a lesser degree, based on peer networks.

The vast majority of group-based studies has been conducted in various setting and has focused on adult-mediated interventions. The outcome of those studies indicates that these interventions are effective in ameliorating the social skills of the above participants, but they have not enabled them to generalize their newly learned skills to new contexts (Gates et al., 2017; Ke et al., 2018; Reichow & Volkmar, 2010) or they have not assessed the generalization of the newly learned skills. Nevertheless, the generalization of skills in different settings and persons constitutes a critical factor for the success of an intervention (Ganz & Ayres, 2018; Laugeson et al., 2015; Rao et al., 2008). The aforementioned adult-mediated studies have been conducted in clinical settings (Barry et al., 2015; Cashin et al., 2013; Chung et al., 2016; Herbrecht et al., 2009; Laugeson et al., 2009; Mandelberg et al., 2014; Olsson et al., 2017; Ozonoff & Miller, 1995; Tse et al., 2007; Weidle et al., 2006; White et al., 2010; White et al., 2013; Yoo et al., 2014), in universities (Dotson et al., 2010; Schohl et al., 2014; Stichter et al., 2012), in community settings (Broderick et al., 2002; Hill et al., 2017; Mackay et al., 2007; Rose & Anketell, 2009; Webb et al., 2004), in the context of horseback riding (Gabriels et al., 2012), in summer camps (Lerner et al., 2011), in general and special educational settings (Gutman et al., 2012; Laugeson et al., 2014; Minihan et al., 2011; Pahnke et al., 2014), and in home settings (State & Kern, 2012). In conclusion, the generalization of newly learned skills has been achieved only in studies that were conducted in naturalistic settings, namely in school settings (Lovett & Rehfeldt, 2014; Minihan et al., 2011; Pahnke et al., 2014) or the community setting (Mitchell et al., 2010).

Evidence emerging from the studies using peer-mediated interventions (PMIs) has indicated that they are advantageous in enhancing the social skills of adolescents with mild forms of ASD as peer partners become models of appropriate behaviors, help them acquire new skills, and adopt new behaviors during learner-initiated and teacher-directed activities (Carter et al., 2017; Chan et al., 2009; Copeland & Buch, 2013; Cushing & Kennedy, 1997; Hughes et al., 2012; Laugeson et al., 2014; Morrison et al., 2001; Odom & Strain, 1986; Platos & Wojaczek, 2018; Reilly et al., 2014; Schmidt & Stichter, 2012; Sperry et al., 2010). As a practice that derives from reciprocal effects of the peer interaction model (REPIM; Humphrey & Symes, 2011) and attribution theory (Weiner, 1986), PMI interventions promote the enhancement of social skills and of inclusive participation for adolescents with ASD. Finally, PMIs are beneficial for peers (non-labeled adolescents) in terms of improving their school engagement, personal growth, and attitudes toward adolescents with disabilities (Chung et al., 2012).

Finally, peer network studies (subcategory of PMI interventions) have been successful in providing learning in context and promoting social interactions among adolescents with ASD without intellectual disability (ID) and their typically developing peers, by including the adolescent with ASD in the intervention, as reported in the three most relevant and recent studies (Koegel et al., 2012; Koegel et al., 2013; Sreckovic et al., 2017).

The results reported in one of these studies (Koegel et al., 2012) indicated that the participation of adolescents with mild forms of ASD without ID in social

clubs increased the duration of their social interactions and the rate of initiations between them and their peers, and it improved their social behavior. Seven adolescents with mild forms of ASD without ID participated in another study (Koegel et al., 2013), which showed that the level of engagement and the rate of initiations of the aforementioned adolescents toward their peers increased when they were engaged with lunchtime activities designed according to their specific interests. In addition, they were able to make friends, and both the aforementioned students and their non-labeled peers enjoyed participating in these activities. Nevertheless, they did not generalize their newly acquired skills to other settings. Finally, in the third study (Sreckovic et al., 2017), the peer network intervention, which was applied in a school context, contributed to promoting the social interactions of three adolescents with mild forms of ASD without ID and to decreasing bullying episodes toward them.

Nevertheless, the above three peer network studies did not examine a number of issues related to the advanced communicative skills of adolescents with mild forms of ASD without ID. We designed the present study to address the following issues: (a) whether a systematically implemented peer network intervention, applied within the school setting of the participants, might enable three adolescents with mild forms of ASD, without intellectual or other disabilities, to develop communication skills, such as making social initiations and responding to their peers' attempts at communication. Social initiations, in the present study, refer to the skills of starting a conversation, introducing topics of relevance, and posing relevant questions, whereas responding to peers refers to responding both verbally and nonverbally to peer-initiated invitations addressing the participants with ASD (b) whether the participants would generalize their newly acquired social skills to a setting.

## Method

### Participants: Characteristics and Standardized Assessment Outcomes

We set the following criteria for participation in the present study: (a) a diagnosis of ASD without comorbid disorders, (b) attendance of middle school, (c) limited social interactions as estimated by teachers and parents of the participants, and (d) parental consent. Based off those criteria, we selected three students for participation.

### First Participant

Participant 1 (Peter) was 14 years old and attended second grade in a public general middle school. He was receiving assistance from a shadow teacher for part of the school day. Peter was the second child of an intact family with a low socioeconomic and educational background, and he had a sister. According to his evaluation conducted in a public institution, his IQ was within the normal range of intellectual functioning with a significant difference between verbal and practical intelligence in favor of the latter (the Greek version of the Wechsler Intelligence Scale for Children [WISC-III] was used; Georgas et al., 1997). In addition, he was characterized as mildly autistic based on an evaluation using the Childhood Autism Rating Scale (CARS; Schopler et al., 1988), with most difficulties demonstrated in social interaction and the sensory domain associated with the idiosyncratic use of objects. He

did not participate in any extracurricular activities, and he had a special interest in computer games. The schoolteacher reported that, at the beginning of the year, he experienced increased anxiety, had headaches and stomach aches, and refused to go to class. During recess time, he remained isolated, and his teachers described him as emotionally distant and challenged in expressing affection. His school performance was very poor, and he often engaged in verbal self-stimulatory behavior during class that annoyed his classmates. His shadow teacher was concerned that he might have been a victim of bullying.

### Second Participant

Participant 2 (Gregory) was 14 years old and attended second grade in a public general middle school. He was receiving assistance from a shadow teacher, and he was referred to a resource classroom for part of the school day. Peter was the firstborn child of an intact middle-class family with a low socioeconomic and educational background, and he had a brother. According to his evaluation conducted in a public institution, his IQ was within the normal range of intellectual functioning (the Greek version of the WISC-III was used; Georgas, et al., 1997). In addition, he was characterized as mildly autistic based on an evaluation using CARS (Schopler et al., 1988), with most difficulties demonstrated in tolerating change. Gregory had a special interest in computers and in Tae Kwon Do. His performance at school was characterized as below average. He had difficulties in initiating social interaction but responded to peers when they approached him during recess time. His teachers described him as emotionally and socially immature which sometimes led to social ridicule. He was also stigmatized by engaging in monologues not being able to follow social communication. He had minimal interactions with peers and reported that he had no friends at school.

### Third Participant

Participant 3 (Andreas) was 14 years old and attended second grade in a public general middle school. Andreas was the firstborn child of a family with upper socioeconomic and educational background and had a brother. According to his evaluation, conducted in a public institution, his IQ was within the upper end of the normal range of intellectual functioning (the Greek version of WISC-III was used; Georgas, et al., 1997). In addition, he was characterized as nonautistic based on an evaluation using CARS (Schopler et al., 1988), with most difficulties demonstrated in tolerating change, sensory processing, establishing relationships, and the emotional domain. Andreas had a special interest in computer games, and he did not participate in any extracurricular activities. His academic performance was excellent. His teachers described him as emotionally distant, with difficulties expressing affection and managing his emotions, which led to excessive outbursts. He also had difficulty understanding social signals. He tried to conceal his difficulties or was unaware of the social and emotional difficulties he encountered in school (as assessed in an informal interview with the researcher).

The lead researcher selected CARS to assess the participants' idiosyncratic characteristics because it is considered a reliable standardized instrument suitable to assess the severity of a wide array of autistic characteristics. Behavior is rated from

1 to 4 (1 = *there is no autism, the child/adolescent does not manifest any of the characteristic symptoms of autism*, 4 = *severe autism, the child/adolescent manifests many symptoms or autism to a large degree*). The total score is calculated based on the scores of each of the 15 categories of autistic characteristics. Table 1 summarizes the characteristics and scores of the participants on standardized instruments.

**Table 1.** *Participant Characteristics and Scores on Standardized Measures*

| Participants | Age (years) | Grade | Gender | Intellectual Ability | CARS- 2* |
|---|---|---|---|---|---|
| Peter | 14 | Second grade of middle school | Male | Average Intellectual Functioning | 33 |
| Gregory | 13 | First grade of middle school | Male | Average Intellectual Functioning | 31 |
| Andrew | 14 | Second grade of middle school | Male | Above Average Intellectual functioning | 29 |

*Range of ASD severity in CARS: students were classified as nonautistic (15–29), mildly-moderately autistic (30–36), and severely autistic (37–60; Table 4).

**Table 2.** *Weekly Treatment Fidelity Checklist for the Researcher (Mosley, 2010; Being Used With Permission)*

| | | Yes | No |
|---|---|---|---|
| 1. | Have I spoken to key people in school and gained their support? | | |
| 2. | Do I have the time we need (with the other teacher) to plan, and to discuss our aims, the language we will use, and how we will work together? | | |
| 3. | Are we and some of the students in the group able to demonstrate the social and emotional skills being promoted? | | |
| 4. | Do we have a signal for each other to use if we need a short "break" while running a circle? | | |
| 5. | Have we agreed on the length of the session? | | |
| 6. | Is it possible for one or both of us to make ourselves available for a few minutes after a session or at another time to talk to any group members who would like such an opportunity? | | |
| 7. | Have we introduced ground rules, sanctions, and incentives? | | |
| 8. | Have we safely ended the series of Circle Time? | | |
| 9. | Did the facilitator organize snacks and games for the end of Circle Time? | | |
| 10. | Has the facilitator informed students for the next week's session? | | |

**Table 3. *Weekly Treatment Fidelity Checklist for the Peer Partners***

| | Yes | No |
|---|---|---|
| 1. Were peers present in the meeting? | | |
| 2. Were peers following the rules of Circle Time? | | |
| 3. Were peers using no put downs? | | |
| 4. Were peers including all participants in subgroup activities and discussions? | | |

### Peer Partners

A group of 24 adolescents without disabilities (12 male and 12 female, aged 13–14) were selected to serve as peer partners (natural models) in order to engage adolescents with ASD to social activities. They were classmates of the participants and were unaware of the participants' diagnosis. Three groups were formed, each including one adolescent with ASD and seven classmates without disabilities.

### Settings, Researchers, and Research Material

For the purposes of this study, we selected a public middle school, located in the southern suburbs of Athens, Greece. The selection was not random but was convenient as the main researcher worked in the selected school. We conducted all peer network meetings and observations at the end of the school day in a classroom that was available and especially arranged for the purposes of the study.

The lead researcher (first author) and a researcher assistant were present during all peer network meetings. Both hold a master's degrees in special education and were experienced secondary school teachers familiar with the needs of adolescents with ASD. The materials used in the study included a "talking object" (wooden egg), a rain stick, a parachute, papers and colorful markers, puzzles, pictures with people (in different social occasions), snacks, board games, a stopwatch to keep track of intervals for coding, a tablet to provide relaxing music during relaxation exercises, and a Sony Handycam HDR-CX 405 HD video camera used to videotape all sessions.

### Dependent Variables

The primary dependent measures used to evaluate the effects of PMI were (a) initiations and (b) responses. Initiations referred to the students' ability to (a) start a conversation; (b) introduce topics of relevance; and (c) make appropriate questions. Responses referred to the ability of participants with ASD to (a) respond verbally and nonverbally to their peers (i.e., thought posture, gestures, eye contact, joint attention, and paralanguage); (b) make use of appropriate behavior (i.e., lack of interruption and use of negative comments, participation in conversation and sharing materials); (c) justify their responses; (d) respond appropriately to humorous, playful situations and exchange compliments with peers; and (e) not imitate their peers verbally or nonverbally (lack of context overgeneralized imitation).

We coded a 10-min sample conversation between each participant and his peers. Then we used a 15-s partial interval coding procedure to record occurrences of all the depended measures. In line with prior single case design studies (e.g., Gena, 2001; Sreckovic et al, 2017), which used a partial interval time sampling procedure

offering only two options for scoring initiations and responses (either as occurring or nonoccurring), the present study followed a similar procedure. Namely, we scored target responses as either correct or incorrect; hence, we considered nonoccurrences as incorrect responses and scored occurrences (provided that response definition criteria were met) as correct responses.

## Procedure

### *General Procedure*

All of the participants' parents were informed about the objectives, duration, and procedures of this study (including videotaping) and provided written consent for their child's participation. From baseline to the last session, the study duration was 6 months. One to two sessions were run per week, and the duration of each research session was approximately 60 min. For 30 min after the intervention, snacks and board games were provided to participants and peers.

Peer partners were recruited using the following procedures: First, participants with ASD were asked to describe their hobbies and interests and to choose peers to network with. Based on their choices, peers were approached and provided descriptions of the program and a rationale for why they should participate. Third, this study applied the systematic method of selecting peers by Harrell et al. (1997) to ensure peers were not likely to behave inappropriately toward participants with ASD (e.g., teasing and stigmatizing).

In this method, peer selection is based on their social status, which is assessed by their classmates, and on their teacher's judgment. More specifically, classmates of peers had to choose from options 1 to 5, where 1 represented *not at all* and 5 stood for *a lot,* in response to the question "Is there someone that you would like to be in the same group?" Classmates also replied to the following questions:

(a) "List three classmates you would like to go out with";

(b) "List three classmates you are good friends with"; and

(c) "List three classmates that you would invite to your party."

Provided the outcome of the analysis of those questions, along with the opinions offered from the teachers regarding the compatibility of peers with the aims of the study, we proceeded to the selection of the peers. We obtained parental consent and participants' and peers' assent from all individuals participating in the study (adapted from Harrell et al., 1997).

### *Identification of Target Behaviors*

Target behaviors relating to social communication skills (e.g., verbal and nonverbal) were identified through interviews with parents and teachers and from participants' diagnoses. Once a specific behavior was identified for each participant, the lead researcher conducted preliminary observations. The lead researcher observed the three participants for 3 months, three times per week, during break, and for 15 min. This information was essential to understanding what would be important to include in each session of the intervention program for every participant.

*Research Design and Experimental Conditions*

We used a single-case-multiple-baseline design across participants with probe assessments in every phase of the study (intervention, and maintenance) to assess the effectiveness of the intervention. Thus, the intervention was systematically applied to one participant at a time, permitting evaluation of the intervention's effectiveness before applying the procedure across additional participants (Kazdin, 2011). We selected a multiple-baseline design to strengthen the internal validity by demonstrating functional relationships when and only when the independent variable was introduced in the intervention (Hayes et al., 1999).

**Baseline**

During baseline, I observed the participants' interactions during the structured group activity and collected data without providing feedback or instructions. When the first participant's response was stable, I introduced treatment for him alone. The second and third participants also required a stable baseline to begin treatment. In addition, I introduced treatment at a later point for the second participant and an even later point for the third. This asynchronous treatment presentation was intentional and was aimed at ascertaining whether change results from the introduction of treatment rather than spurious, experimentally uncontrolled factors. The second participant was introduced after (Kazdin, 2011).

**Intervention**

The present study employed a manualized program called Circle Time (Mosley, 2010; Mosley & Tew, 2013). This program has been applied in elementary, middle, and high schools to help children and adolescents develop social skills.

Circle Time involved a number of activities, which participants completed in five steps during each session. During the first step, participants played a game in which they functioned as a team and enjoyed themselves (about 10 min). During the second step, members of the circle passed a talking object (a wooden egg) around and talked about themselves while holding the egg (about 13 min). During the third step, the participants engaged in more challenging tasks (e.g., tasks requiring advanced language and communication skills) and engaged in pairs and in small groups (about 23 min). During the fourth step, the participants had opportunities to express their gratitude for participating in the group and to nominate others for being kind (about 7 min). During fifth step, I introduced a relaxation procedure to help the participants end the session in a pleasant manner (7 min).

The five steps described above were designed to help the participants develop the following social skills: introducing oneself to a group, undertaking responsibilities within the context of a group, making "I" statements, understanding how one's behavior as a group member affects the behavior of the other members, developing listening skills, resisting peer pressure, asking for help when necessary, acting positively when things go wrong, accepting criticism, understanding the difference between facts and opinions, volunteering, and following instructions.

## Program Implementation

The intervention phase included two components: an introduction meeting and weekly peernetwork meetings. Each peer network held a one-hour introduction meeting to establish and clarify the rules of participation in Circle Time for all participants. The intervention phase lasted approximately 10 weeks for each peer network and took place at the end of the school day.

A facilitator was present during all peer network meetings. Two people functioned as facilitators: the lead researcher and a research assistant (RA). The lead researcher holds an M.Ed. and has prior experience implementing social interventions with typically developing adolescents and with adolescents with ASD. The RA is a high school teacher who holds an M.Ed. and has experience teaching students with special needs and ASD. All participants with ASD and peers attended these meetings.

## Generalization and Maintenance

Generalization probes were conducted for all participants to assess the generalization of treatment gains with ASD in an unstructured setting (i.e., in the schoolyard during breaks). No intervention occurred during generalization probes. The procedures followed during generalization sessions were identical to those followed during baseline. Four generalization sessions were conducted after the intervention.

## Generalization Probes in an Unfamiliar Setting with Unfamiliar Peers and Adults

Generalization data were also collected during a school visit to a Greek island. Two of the three participants, Gregory and Andrew, joined this trip. Generalization data were collected on three occasions on three days. The procedures followed during generalization sessions were identical to those followed during baseline.

## Maintenance

The maintenance phase lasted four weeks and began immediately after the intervention phase ended. The procedures followed during maintenance sessions were identical to those followed during baseline.

### *Data Collection Procedure*

Two observers collected data and scored the videotaped sessions independently. The letter C indicated correct responses, and W indicated incorrect responses. The observers scored the absence of a response as an incorrect response for the reason stated in the Dependent Variables section. For each subcategory (e.g., Starting a Conversation, Introducing Relevant Topics, Asking Relevant Questions), the observers calculated the percentage of correct responses per session by dividing the number of correct responses by the sum of correct and incorrect responses and multiplying the quotient by 100. To calculate each data point, the observers added the percentages for all subcategories and divided the sum by the number of subcategories per response category.

## Interobserver Agreement

Interobserver agreement (IOA) was assessed for at least 33% of the sessions per experimental phase (Kazdin, 2011). Two observers, who had participated in the

training protocol before the study began and were blinded to the treatment status, undertook the responsibility of data collection. The IOA percentages were calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying the quotient by 100%. IOA ranged from 95% to 100% across all three phases.

**Treatment Fidelity**

The lead researcher completed a checklist during all experimental sessions to ensure that she followed all the procedures indicated by the research protocol properly. To assess treatment fidelity, blinded independent raters used the same checklist (Reichow & Volkmar, 2010). Average treatment fidelity was 95% (range: 90–100%) across all experimental sessions. Average IOA for treatment fidelity was 95% (range 90–100%). The facilitator followed the same procedure and obtained similar results. Specifically, average treatment fidelity was 95% (range: 90–100%) across all experimental sessions, and average IOA for treatment fidelity was 95% (range: 90–100%).

In addition to variables associated with the application of the procedures, four independent professionals assessed treatment fidelity for the materials used during the intervention. A checklist that included items pertaining to the content and the structure of each Circle Time session was developed for this assessment. The assessment's results indicated that the procedures designated by the research protocol were followed with 100% fidelity.

**Social Validity**

Social validation data were collected to assess the intervention's importance, acceptability, and effects. Participants with ASD, their parents, peer partners, and the special education teacher who assisted in recruiting participants with ASD and peer partners completed the questionnaires developed for the treatment outcome's social validation. Parents and school personnel were not involved in the study—although school personnel helped with recruitment and knew the intervention occurred—but they were key stakeholders for the participants' education choices (Wolf, 1978).

## RESULTS

All three participants demonstrated progress in all targeted areas. Figures 1–8 present the percentages of targeted social skills for each participant at baseline and during intervention, generalization, and maintenance. The vertical dashed lines indicate the starting points of the intervention for each category. The data points depicted by the closed circles represent the percentages for which the participants received training, the points depicted by triangles represent the generalization data, and the points depicted by squares represent.

During baseline, Peter's average percentage were as follows: 16% for Starting a Conversation (range: 10–20%); 12% for Relevant Topics (range: 10–20%); 22% for Asking Appropriate Questions (range: 20–30%); 46% for Verbal and Nonverbal Responses (range: 40–50%); 66% for Behavioral Skills (range: 60–70%); 12% for Justification of Responses (range: 10–20%); 12% for Responses to Humor, Playful Teasing, and Compliments (range: 10–20%); and 88% (range: 80–90%) for context overgeneralized imitation (Figures 1–8). With intervention, Peter's average percent-

ages increased to 35% (range: 30–40%) for the first category, 33% (range: 30–40%) for the second, 40% (range: 30–50%) for the third, 69% (range: 60–80%) for the fourth, 85% (range: 80–90%) for the fifth, 50% (range: 40–60%) for the sixth, 36% (range: 30–40%) for the seventh, and 48% (range: 40–50%) for the eighth. During generalization in a nonstructured context (i.e., at break), the first participant showed improved performance compared to baseline. Average percentages were 40% (range: 30–50%) in the first category, 37.5% (range: 30–40%) in the second, 47.5% (range: 40–50%) in the third, 77.5% (range: 70–80%) in the fourth, 82.5% (range: 80–90%) in the fifth, 32.5% (range: 30–40%) in the sixth, 37.5% (range: 30–40%) in the seventh, and 45% (range: 40–50%) in the eighth. During maintenance, a slight decrease occurred compared to the intervention in all categories except context overgeneralized imitation, which had a slight increase compared to intervention but not reach baseline levels. Finally, the first participant did not participate in generalization in a different context.

During baseline, Gregory's average percentages were as follows: 31.43% (range: 30– 40%) for Starting a Conversation; 32.86% (range: 30–40%) for Relevant Topics; 31.43% (range: 20–40%) for Asking Appropriate Questions; 52.86% (range: 40–60%) for Verbal and Nonverbal Responses; 52.86% (range: 60–80%) for Behavioral Skills; 12.86% (range: 10–20%) for Justification of Responses; 34.29% (range: 20–40%) for Responses to Humor, Playful Teasing, and Compliments; and 68.57% (range: 80–90%) for context overgeneralized imitation (Figures 1–8). With intervention, Gregory's average percentages increased to 60% (range: 50–70%) for the first category, 60% (range: 50–70%) for the second, 72% (range: 60–80%) for the third, 65% (range: 60–70%) for the fourth, 69% (range: 60–80%) for the fifth, 50% (range: 20–60%) for the sixth, and 57% (range: 40–70%) for the seventh. For the final category, context overgeneralized imitation, the average percentage decreased to 42% (range: 30–70%). During generalization in a nonstructured context (i.e., at break), the second participant showed improved performance compared to baseline. His average percentages were 50% (range: 40–60%) in the first category, 47.5% (range: 40–50%) in the second, 75% (range: 70–80%), in the third, 72.5% (range: 70–80%) in the fourth, 75.% (range: 70–80%) in the fifth, 60% (range: 60–60%) in the sixth, 50% (range: 50–50%) in the seventh, and 42.5% (range: 40–50%) in the eighth. During maintenance, a slight decrease occurred compared to the intervention in all categories, but it did not reach baseline levels except in context overgeneralized imitation, which increased slightly compared to the intervention. Finally, during generalization in a different context after maintenance, the second participant demonstrated improved performance in all categories compared to his performance at baseline, but he did not reach the response levels demonstrated during the intervention phase.

At baseline, Andrew's average percentages were as follows: 32.2% (range: 20–40%) for Starting a Conversation; 37.78% (range: 30–40%) for Relevant Topics; 68.89% (range: 60–80%) for Asking Appropriate Questions; 48.9% (range: 40–60%) for Verbal and Nonverbal Responses; 46.67% (range: 40–70%) for Behavioral Skills; 16.67% (range: 10–20%) for Justification of Responses; 56.67% (range: 40–70%) for Responses to Humor, Playful Teasing, and Compliments; and 62.22% (range: 50–70%) for context overgeneralized imitation (Figures 1–8). With intervention, Andrew's average percentages increased to 66% (range: 60–70%) for the first category,

68% (range: 60–70%) for the second, 86% (range: 80–90%) for the third, 75% (range: 70–80%) for the fourth, 77% (range: 70–80%) for the fifth, 71% (range: 60–80%) for the sixth, and 76% (range: 70–80%) for the seventh. For the final category, context overgeneralized imitation, the average percentage decreased to 28% (range: 20–30%). During generalization in a nonstructured context (i.e., at break), the third participant showed improved performance compared to baseline. His average percentages were 15.4% (range: 8.33–21.6%) in the first category, 15.4% (range: 8.33–21.6%) in the second, 15.4% (range: 8.33–21.6%) in the third, 75% (range: 70–80%) in the fourth, 77.5% (range: 70–80%) in the fifth, 65% (range: 60–70%) in the sixth, 65% (range: 60–70%) in the seventh, and 42.5% (range: 40–50%) in the eighth. During mainte-nance, a slight decrease occurred compared to the intervention in all categories, but it did not reach baseline levels except in context overgeneralized imitation, which increased slightly compared to the intervention. Finally, during generalization in a different context after maintenance, the third participant demonstrated improved performance in all three categories compared to the baseline did not reach interven-tion levels.
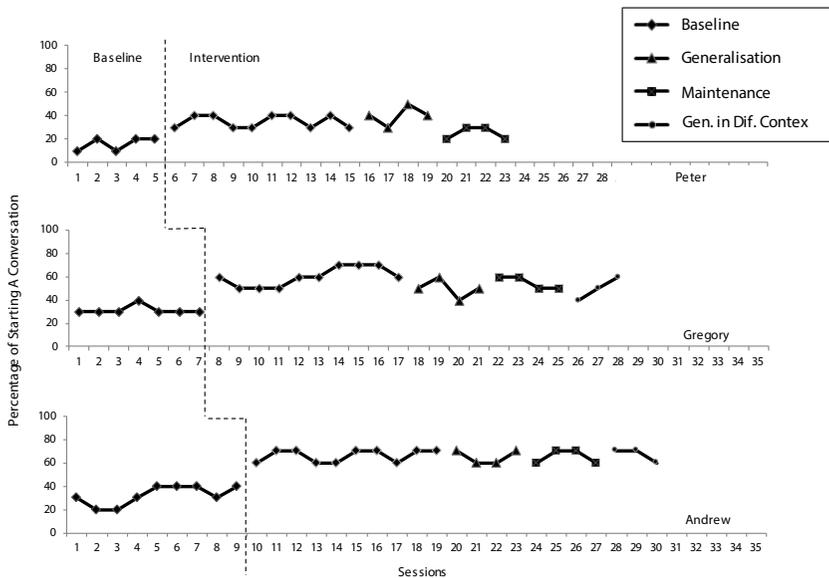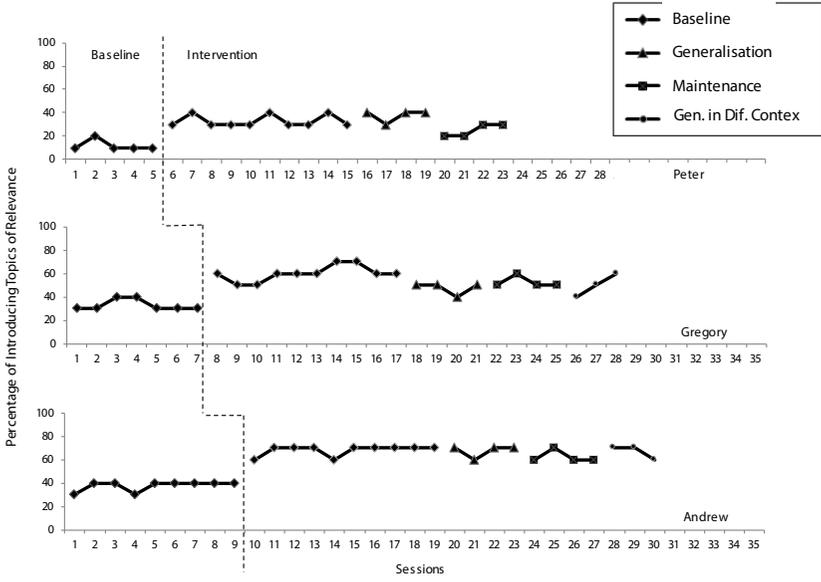


*Figure 1.* **Starting a conversation.**

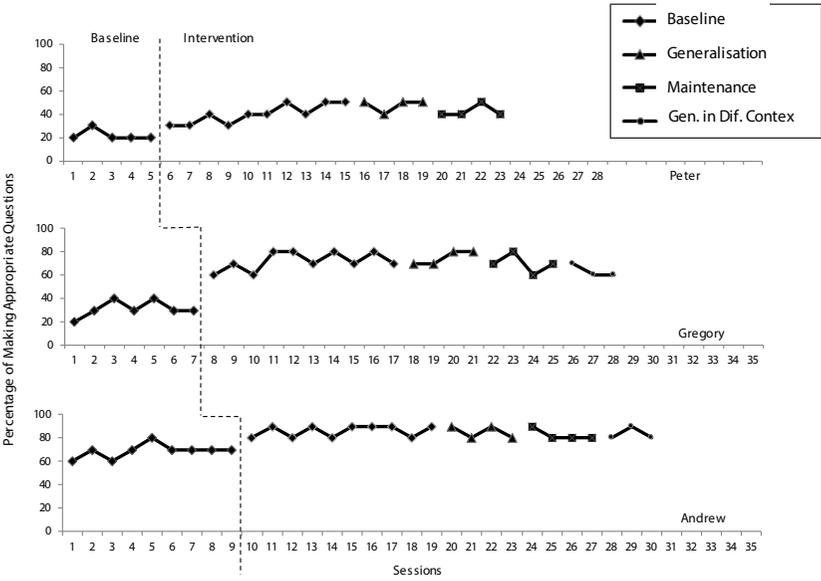*Figure 2.* **Introducing topics of relevance.**



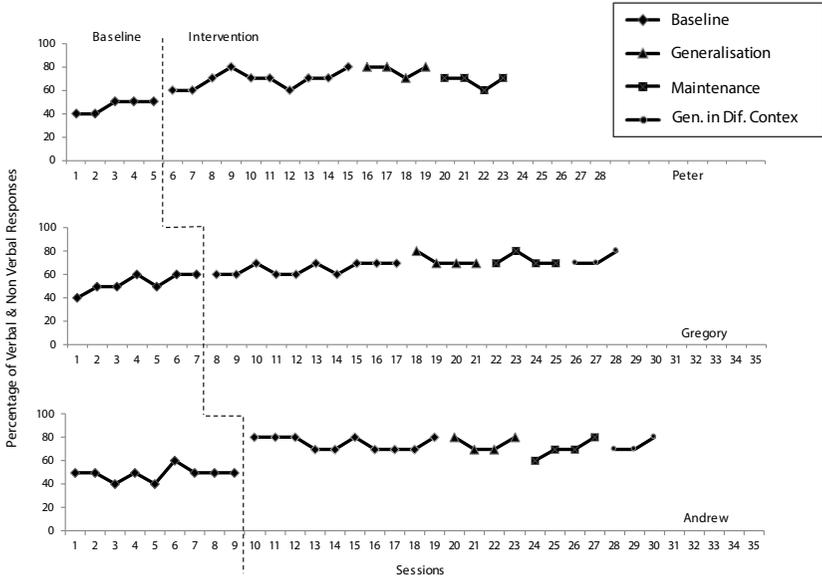*Figure 3.* **Making appropriate questions.**

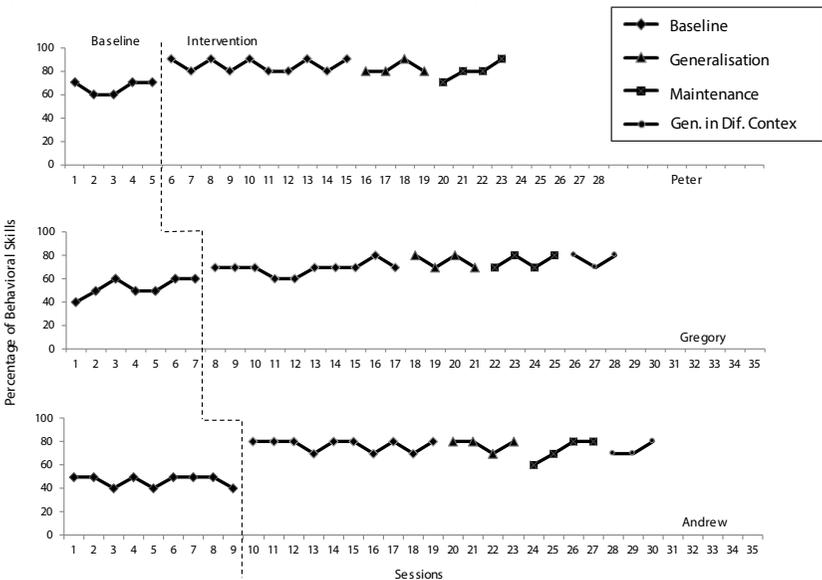*Figure 4.* **Verbal and nonverbal responses.**
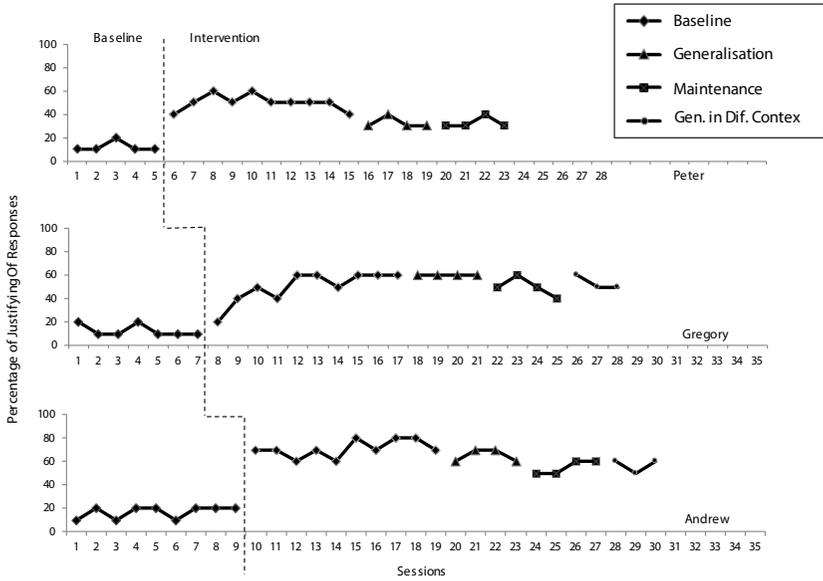


*Figure 5.* **Behavioral skills.**

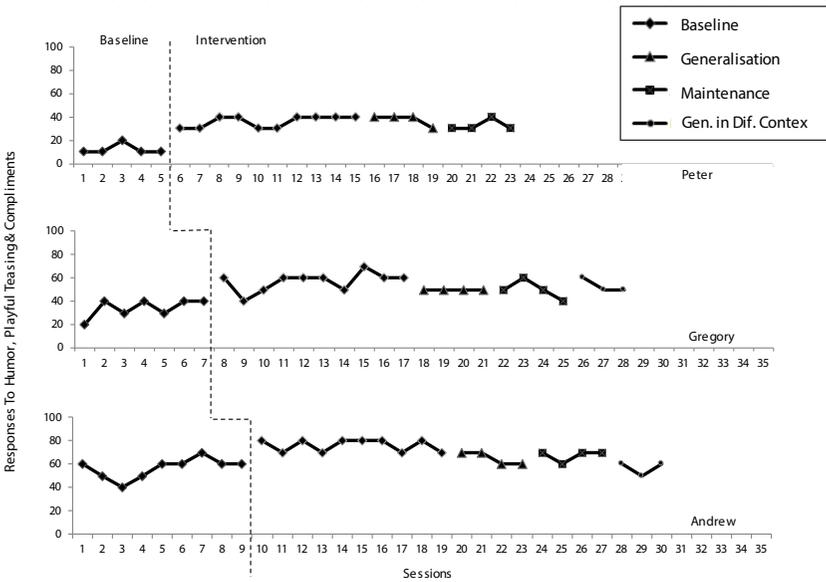*Figure 6.* **Justification of responses.**



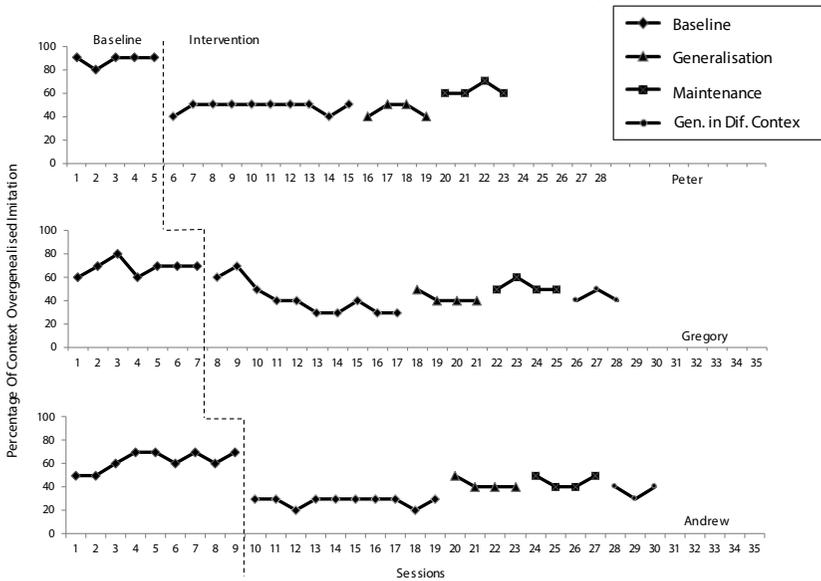*Figure 7.* **Responses to humor, playful teasing, and compliments.**

*Figure 8.* **Context overgeneralized imitation.**

## Social Validity

### Participants With ASD

Prior to and after the intervention, participants with ASD completed a checklist in which they stated that they would like to have friends at school to join and talk to. All three participants reported that they were excited to be part of the peer network team, and they reported enjoying all the activities, discussions, and games. In addition, they considered all of their peers in the peer network to be their friends, and they reported that they would like to participate in a peer network social group in the future. They also stated that during the study, they learned how to begin a conversation with, talk to, and play with peers whom they would not have met if not for their participation in the peer group. Furthermore, they claimed to have understood the importance of making their preferences known politely and communicating properly with their peers. Finally, two participants stated that they learned how to handle difficult situations at school, and one stated that he learned when to ask for help.

### Parents of Participants With ASD

All parents acknowledged the importance of their children's improving their social skills, which they achieved by participating in the peer network. Positive outcomes of their participation, as understood by their parents, included the following:

(a) the children were happier about going to school after the intervention; (b) the parents were less worried about their children being alone during break time and being victimized verbally by their classmates; (c) the children were excited about participating in the excursion and became more confident about talking to their peers; and (d) the children made new friends at school and felt able to fit in.

## *Peer Partners*

All peer partners stated that they were excited about their participation in peer networks. Positive outcomes of their participation included the following: (a) peer partners enjoyed being members of a peer network, and their views on students who need extra help improved; (b) they stated that they would initiate conversations with students sitting by themselves during break and would try to engage their socially isolated classmates; (c) they learned how to cooperate with, respect, and help others, and they felt more confident in handling difficult situations at school; and (d) they stated they learned to communicate with others in a more satisfactory way.

### *School Personnel*

School personnel emphasized the importance of peer network participation for the participants with ASD, and the majority of educators considered the intervention efficient and possible for teachers to implement themselves. Positive outcomes included the following: (a) the three participants no longer remained isolated, and their social skills improved overall; (b) Gregory and Andrew volunteered and were more engaged in class; and (c) upon completion of the intervention, peers were more willing to include participants with ASD in social activities.

### DISCUSSION

In the present study, a systematically implemented peer network intervention applied within the participants' school setting enabled three adolescents with mild forms of ASD without intellectual or other disabilities to develop communication skills, such as initiating social contact and responding to peers' attempts at communication. Furthermore, all three participants achieved the maintenance and generalization of newly acquired skills in an unstructured context (e.g., during recess in the schoolyard), and two out of three achieved generalization in a different context (i.e., an excursion). The present study's findings replicate the findings of prior individualized interventions aimed at helping children with ASD improve and generalize newly acquired social skills in school settings (Koegel et al., 2012; Koegel et al., 2013; Sreckovic et al., 2017).

The results of this study are clinically significant and socially valid. The intervention improved the three participants' social skills and led to a change in their social behavior (e.g., improvement of social initiations). Furthermore, the present study's results demonstrated the potential benefits of incorporating Circle Time as a peer network intervention to teach social skills to students with ASD and demonstrated the importance of coeducational experiences for adolescents with ASD and their peers without disabilities. Specifically, the adolescents with ASD improved their social skills, and their peers became more open-minded about diversity and

inclusive educational practices. In addition, the study's results expand upon prior findings by examining not only the quantity but also the quality of social skills (e.g., initiations and responses to peers' social initiations) of adolescents with ASD, and they replicate previous findings regarding the efficacy of interventions implemented in a naturalistic setting and the achievement of socially valid outcomes (Wolf, 1978). Moreover, the intervention included direct instruction and incidental teaching to facilitate social skill acquisition because ASD learners have difficulty improving their social behavior by observing their peers (Ke et al., 2018). The intervention also included relaxation exercises, which help adolescents with ASD regulate their elevated anxiety levels (Bellini, 2006). Finally, the intervention was individualized, which helped not only with skill acquisition, but also with the generalization and maintenance of newly acquired skills (Bellini et al., 2007; Krasny et al., 2003; Rao et al., 2008; Watkins et al., 2015).

This study contributed to the literature on secondary adolescents with mild forms of ASD without ID, which remains limited. The study's results replicate and expand upon prior findings pertaining to the social behavior of individuals with ASD (Koegel et al., 2012; Koegel et al., 2013; Sreckovic et al., 2017). Specifically, the results reveal the importance of teaching social skills to students with mild forms of ASD in general education middle schools and demonstrate that when peers perceive students with ASD as having similar attributes, the possibility of interacting with them increases (DiSalvo & Oswald, 2002; Ganz & Ayres, 2018; Sreckovic et al., 2017). Finally, the study's results align with and extend the limited literature on social skills instruction in naturalistic settings that accounts for participants' individual needs and includes peer networks (Koegel, 2012, 2013; Gardner et al., 2014; Hockman et al., 2014; Sreckovic, 2017).

In addition, after the intervention, the lives of the participants with ASD improved in important ways, as they acquired basic social behaviors that helped them become more functional. The parents and teachers' written reports also enhanced the intervention's social validity.

The study's results may be highly applicable to educators who struggle to use unobtrusive interventions in general classes that include adolescents with ASD, who increasingly participate in general education schools.

In summary, the present study indicates that incorporating Circle Time as a peer network intervention may be effective in enhancing the social skills of adolescents with mild forms of ASD in general education schools. Furthermore, this study gives some weight to the suggestion that interventions implemented in a real-world context (school) leads to the acquisition, generalization, and maintenance of social skills. Enhancing of social deficits of adolescents with ASD can be a proactive way to limit possible behavioral, emotional and learning difficulties which are all correlated. Therefore, by applying targeted interventions adolescents with ASD can be encouraged to fulfill their potential, namely, to graduate, to be hired and being admired for their specific skills.

**Limitations for Practice and Future Research**

Although this study contributes to the existing literature, it does have limitations. All participants were male adolescents with ASD. It will become important

to assess whether this intervention can also benefit female participants. The findings require replication with a greater number of participants and with an assessment of maintenance in a greater length of time (e.g., 6 months after the termination of intervention).

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