Published in final edited form as:
Behav Modif. 2012 May ; 36(3): 361–377. doi:10.1177/0145445512445609.

Improving Generalization of Peer Socialization Gains in Inclusive School Settings using Initiations Training

Lynn K. Koegel,
Counseling, Clinical, & School Psychology, University of California, Santa Barbara

Sarah Kuriakose,
Counseling, Clinical, & School Psychology, University of California, Santa Barbara

Anjileen K. Singh, and
Counseling, Clinical, & School Psychology, University of California, Santa Barbara

Robert L. Koegel
Counseling, Clinical, & School Psychology, University of California, Santa Barbara.

Abstract

Social engagement by children with autism spectrum disorder (ASD) in unstructured school settings generally occurs at very low levels, if at all. Although many interventions improve peer socialization, generalization and maintenance of such gains when interventions are faded is typically low. The present study employed a multiple baseline design across participants to target generalization in the absence of interventionists in elementary school children with ASD at recess. Teaching initiations has been suggested as one method to increase generalization. The results of the present study showed that when initiations were targeted during intervention for social play, the participants demonstrated generalized peer social engagement, increases in unprompted peer-directed initiations, and more positive affect during peer interactions. Results are discussed in terms of theoretical and applied implications of incorporating initiations training into social interventions.

Keywords

Autism; Autism Spectrum Disorder; Socialization; Inclusion; Initiations; Pivotal Response Treatment; Generalization

Impairment in social functioning is a core symptom of autism spectrum disorders (ASD), (American Psychiatric Association, 2000). Even children with ASD who have IQs of 50 or above, which are generally correlated with more favorable outcomes, may have few or no friends or acquaintances in adulthood (Howlin, Goode, Hutton, & Rutter, 1994). Social relationships provide emotional support and protection from peer rejection and loneliness, and can be helpful in mitigating interpersonal conflicts and stresses (Bauminger, Solomon, Aviezer, Heung, Brown, & Rogers, 2008; Burgess, Wojslawowicz, Rubin, Rose-Krasnor & Booth-LaForce, 2006). Social isolation in childhood is associated with poor developmental outcomes, including an increased likelihood of adult psychopathology (Church, Alisansi, & Amanullah, 2000). Further, peer isolation in childhood often leads to challenges in

Correspondence concerning this article should be addressed to Dr. Lynn Kern Koegel, Koegel Autism Center, Clinical, Counseling, and School Psychology Department, Graduate School of Education, University of California, Santa Barbara, Santa Barbara, California, 93106-9490. Phone: (805) 893-2049. lynnk@education.ucsb.edu.

adulthood, including decreased participation in recreational and social activities and more difficulties obtaining and maintaining employment (Koegel & LaZebnik, 2009).

When compared to their typical peers, children with ASD interact less with other children, remain closer to adults, and are less physically active, even at recess times when peers are abundant (Anderson, Moore, Godfrey, & Fletcher-Flinn, 2004; Wainscot, Naylor, Sutcliffe, Tantan, & Williams, 2008; Koegel, Koegel, Frea, & Fredeen, 2001). Because there are increasing numbers of children with ASD being included in general education settings (Yeargin-Allsopp, Rice, Karapurkar, Doernberg, Boyle, & Murphy, 2003) where frequent contact between children with ASD and their typical peers is possible, recess periods are an ideal time to implement systematic programs targeting socialization. Intervention during school recess periods has the advantage of using a natural setting, which is associated with increased skill acquisition and generalization (Gresham, Sugai, & Horner, 2001; Krasney, Williams, Provencal, & Ozonoff, 2003; McConnell, 2002; Rao, Beidel, & Murray, 2007). In addition, daily recess periods offer a multitude of opportunities to practice specific social areas within a peer group. Unfortunately, efforts at implementing intervention at recess are often hampered by the lack of direct support (Harper, Symon, & Frea, 2008), as daily intervention may not be available, feasible, or cost-effective.

Therefore, it is important to study and develop social interventions that can be implemented during the recess periods that result in generalized socialization in children with ASD when adults are faded. This is especially important, as generalization has been either difficult to achieve or neglected altogether in the majority of studies targeting socialization. In fact, a meta-analysis of all school-based socialization interventions published between 1986 and 2005 found that only 15 out of 55 reported generalization data (Bellini, Peters, Benner, & Hopf, 2007). Those that did report the data found low generalization effects. For this reason, reviews and recommendations in this area of study have consistently directed researchers to design interventions to increase generalization of social areas (Hwang & Hughes, 2000; McConnell, 2002; Rao et al., 2007).

Teaching initiations has been suggested as one method to increase generalization (Bellini et al., 2007). Because many children with ASD may be capable of engaging in playground activities, it is reasonable to suggest that if children with ASD are able to initiate participation in social activities, they may be able to maintain social engagement without adult facilitation. In addition, research has shown that initiations are associated with long-term positive outcomes in children with ASD (Koegel, Koegel, Shoshan, & McNerney, 1999). While previous studies have shown that adult-facilitated social interactions can lead to increased social engagement in free-play settings, with some generalization on the same day of intervention, results fail to generalize and maintain on school days when the intervention is not being implemented (Koegel, Vernon, Koegel, Koegel, & Paullin, in press).

Therefore, the purpose of the current study was to assess whether teaching initiations would result in generalization of socialization in elementary school children with ASD when an interventionist was not present. A non-concurrent multiple baseline across participants design was used to examine whether the addition of initiations training to a facilitated social play intervention would enhance generalization when interventionists were not present. To control for order effects of the phases, one child participated only in the Social Intervention with the Initiations phase, implemented immediately following baseline. Specifically, we assessed whether the intervention would improve social engagement, unprompted peer-directed initiations, and affect when interventionists were not present.

Method

Participants

The participants for this study were three kindergartners who were fully included in general education classrooms. Two of the participants had the assistance of full-time aides. Each participant had a diagnosis of autism or Asperger Syndrome from an outside agency and were referred to the University of California's Koegel Autism Center for intervention. Their diagnoses were confirmed by staff at our Center. Criteria for participation in the study included educational placement in an age-appropriate full-inclusion setting, the presence of verbal communication (since this study targeted verbal initiations with peers), but lacked peer interaction according to parent and teacher report, as well as direct observation. Individual child characteristics are described below.

Daniel—Daniel was a 5-year-old European-American boy diagnosed with autism. Daniel spoke in simple sentences with a mean length of utterance of four words. He engaged in some self-stimulatory behavior including grunting and viewing objects out of the corner of his eyes. Daniel spent most of his recess sifting sand through his fingers and engaged in delayed echolalia, primarily related to cartoon characters, while lying under the slide on the school playground. He did not initiate to peers and often failed to respond appropriately if approached by a peer. He exhibited inflexibility in conversation, preferring to talk only about his perseverative interests, which were dogs and horses. When frustrated, Daniel engaged in disruptive behaviors. For example, he tended to elope when asked to participate in non-preferred activities and to scream loudly in the face of peers and adults. According to the special education staff and his school records, Daniel was functioning at about a year below grade level and exhibited communication delays of about a year and a half.

Ryan—Ryan was a 5-year-old European-American boy diagnosed with Asperger Syndrome. Ryan did not exhibit any vocabulary or language delays, was of average intelligence, and was capable of speaking in complete and complex sentences. He rarely initiated conversation and most of his utterances were responses to questions from adults. At school, Ryan often spoke in an inaudible voice and usually had his fingers or sleeve in his mouth. Ryan spent most of his recess walking around the perimeter of the playground alone. According to the special education staff and school records he functioned above grade level academically and had no language delays.

Liana—Liana was a 6-year-old Latina girl diagnosed with autism. Liana was capable of speaking in complete syntactically correct sentences with a mean length of utterance of three words. She exhibited some delayed echolalia, consisting of scripting from media such as Spongebob Squarepants and news programming. Liana spent most of her recess playing alone on the play structure while engaging in delayed echolalia. She did not initiate to peers and often failed to respond appropriately if a peer approached her. When frustrated, Liana engaged in non-compliant behavior consisting of screaming, whining, crying, and lying down on the ground. According to special education staff and school records, she functioned about a year below her grade level, although her reading was at grade level and her communication was approximately two years below her chronological.

Settings and Materials

The study took place on playgrounds of K-6 public elementary school campuses. Daniel and Ryan attended the same school but were fully-included in different classrooms and Liana attended a different school. Baseline, intervention, and generalization sessions for each participant were collected on the playground during a recess period after the children finished eating lunch (Daniel and Ryan) or morning snack (Liana) and left the table area for

the playground. The school playground areas contained a large climbing structure, a swing set, and a grassy open area. In addition, a variety of common playground toys were available for the children, such as balls, jump ropes, and board games.

Experimental Design

In order to assess intervention and generalization effects of clinician-facilitated social play only and clinician-facilitated social play with initiations training, a non-concurrent multiple baseline across three participants was used to evaluate the effects of initiations training on generalization of socialization gains. Daniel and Ryan's interventions were implemented concurrently. In addition, to control for order effects of the conditions, one child participated only in the social play intervention with initiations training condition following baseline. Specifically, Liana's sessions were conducted following the completion of Daniel and Ryan's sessions. Staggered baseline data were collected for three, five, and seven sessions, respectively, across the participants. Video probes were collected daily throughout all conditions of the study for data analysis purposes. The probes were collected for ten minutes. For Daniel and Ryan, these probes were collected for the first ten minutes of the 15-minute daily recess period and for Liana, this interval covered the entirety of the 10-minute morning recess. During all conditions, the probe was started as soon as the participant was on the playground.

Procedures

Throughout all phases of the study, playground monitors circulated around the play areas but rarely interacted with any students. Two participants, Daniel and Liana, had one-on-one aides during academic instruction but they took lunch/snack breaks at the same time as the children and therefore did not interact with them. The interventionists were beginning graduate and undergraduate university students majoring in psychology and had experience and coursework in using Pivotal Response Treatment.

Baseline—During baseline, the participants played as they typically did during recess. No additional instructions or prompts were provided.

Facilitated social play without initiations training—During this condition, the interventionists used Pivotal Response Treatment strategies to facilitate social interactions without prompting or teaching initiations. Specifically, child choice and task variation were incorporated in social play. The child was asked to choose a game or activity and peers with whom he or she wanted to play. The interventionist invited peers to join in a game that the child with ASD had chosen. Once the activity had begun, the interventionist continued to facilitate the game. The interventionist was instructed not to provide any explicit prompts for the participant to initiate to peers during this condition. The interventionist was instead instructed to (1) encourage the child with ASD to play during each lunch recess, (2) prompt responses towards peers when peers addressed the participant, and (3) supervise the game so that it was played according to the rules.

Facilitated social play with initiations training—In this condition, the interventionist followed the same Pivotal Response Treatment procedures in the previous condition, but asked the participant to choose a peer or peers to play with and verbally prompted the participant to initiate to the peer(s). The interventionist no longer prompted any peers to join in the game. Instead, the interventionist prompted the participant to make initiations related to game play. These included initiations to begin a game (e.g. “Why don't you say ‘Hey, let's play tag’ to Susie”, or “If you want to play with Johnny and Robbie you can say ‘Do you want to play tag?’ to them”), join in an existing game (e.g. “Ask Brendon ‘Can I play with you?”), transition to a different game (e.g. “It looks like you want to play a different game,

tell your friends 'let's play basketball now"), and to continue a game (e.g. "Say 'it's my turn'"). As in the first condition, the interventionist continued to prompt the child to respond to peers when they addressed the participant.

Generalization—Of primary interest in this study was whether generalization effects would be observed. To assess whether the gains made during the intervention facilitated social play intervention sessions generalized to times when no interventionist was present, generalization probes were collected throughout both conditions. As in the baseline, the participants played as they typically did during recess. No additional instructions or prompts were provided. Representative video probes were collected approximately weekly throughout baseline, intervention, and generalization. They were taped by individuals unfamiliar to the participants.

Dependent Variables

The dependent variables were measured through analysis of the video probes. All dependent variables were scored in a small room on the campus by undergraduate student observers who were naïve to the hypotheses of the study. To control for observer drift and to reduce the possibility of bias, video probes were presented in random order.

Unprompted peer-directed initiations—In order to assess whether the intervention produced unprompted initiations, the number of times the participant verbally initiated to a peer was recorded from each video probe. An initiation was defined as any spontaneous peer-directed utterance that was not preceded by another child's question or comment requiring a response.

Social engagement—In order to assess whether the intervention produced peer social engagement the video clips were scored to analyze the amount of time the participant engaged with peers throughout all phases of the study. Social engagement was defined as reciprocal interaction, verbal and non-verbal, between the participant and a typical peer while engaging in a mutual activity. Each ten-minute video clip was divided into twenty 30-second intervals and a partial interval recording system was used. If the child engaged in social interaction during 15 seconds or more during the interval, the interval was scored as the occurrence of social engagement. During time periods that the child was not near other children or in the proximity of other children but not actively socially engaged in an activity with peers for at least 15 seconds, the interval would not be coded as an occurrence social engagement.

Affect—In order to assess the quality of the interaction, an overall affect rating was scored for each video probe. This measure was adapted from scales used in studies that have investigated child affect during interactions (Koegel & Dunlap, 1980; Koegel & Egel, 1979; Vismara & Lyons, 2007). The affect scale is shown in Table 1. Affect was scored based on a 0-5 point Likert scale and categorized as negative (0-1), netural (2-3), and positive (4-5).

Interobserver Agreement

Two observers, both naïve to the hypothesis of the study independently rated 30% of video probes from all experimental conditions and participants. Video probes were presented in random order for each participant to account for observer drift. For all measures reliability was calculated according to the formula: number of agreements divided by number of agreements plus disagreements, multiplied by 100. For initiations each observer wrote down the child's initiation and an agreement was defined as both observers writing the same initiation. In order to be sure that point by point reliability occurred on the video probes for initiations, both observers had to write the exact same child utterance and the time that it

occurred during the interval. For social engagement, an agreement was defined as both observers recording the occurrence or non-occurrence of social behavior during the 30 second interval. For the Likert scale (affect), an agreement was defined as both observers being within the same affect category. Interobserver agreement for unprompted initiations was 94% (range 80-100%). Interobserver agreement for social engagement was 95% (range 70-100%). To control for agreement by chance, kappa was calculated and found to be 0.90, which is considered very good. Kappa was also calculated for affect and found to be 0.89, which is considered very good.

Treatment Fidelity

Treatment fidelity was calculated for 30% of all three conditions: baseline, interventionist facilitated social play only, and interventionist facilitated social play with initiations training. In the baseline condition, (1) no interventionists were present and (2) no prompts of any kind were provided to participants. Condition fidelity was met for 100% of observed sessions in baseline. In the interventionist facilitated social play only condition, (1) the interventionist provided a choice of activity, (2) the interventionist provided a choice of peers to play with, (3) the interventionist invited peers to join into the game, (4) the interventionist facilitated play by prompting responses towards peers when peers addressed the participant, and (5) the interventionist did not provide prompts to initiate to the participant at any time. Treatment fidelity was met for 98% of observed sessions in this condition. In the interventionist facilitated social play with initiations training, (1) the interventionist asked the participant to choose a peer or peers to play with, (2) the interventionist verbally prompted the participant to initiate to the peer(s) to join the game, (3) the interventionist prompted the participant to make initiations related to game play including initiations to begin a game, join in an existing game, transition to a different game, and continue a game, and (4) the interventionist facilitated play by prompting responses towards peers when peers addressed the participant. Treatment fidelity was met for 100% of observed sessions.

Results

Intervention and generalization data (i.e. when the interventionist was present and when the interventionist was not present) for social engagement are presented in Figure 1. In all cases, consistent with parent and teacher report, the children had no or few intervals of engagement during baseline. Following implementation of the social intervention without initiations training for Daniel and Ryan, social engagement rates rose immediately and dramatically during intervention sessions. However, during this condition, generalization data indicated that the children engaged with peers only at levels slightly above baseline.

When the social intervention with initiations training was implemented, data for all three children indicated that social engagement remained at rates above baseline during intervention sessions. More importantly, the generalization data (when no interventionist was present) showed very high levels of social engagement occurring rapidly after the initiations training was implemented. Experimental control was demonstrated, as there was no change seen until this condition was implemented for each participant. Follow-up data were collected for Daniel and showed maintenance of generalization effects three months after intervention was discontinued.

Specifically, Daniel did not engage with peers at all during baseline probes. During implementation of the first condition, his social engagement rose to an average of 66% of intervals engaged. However, during generalization sessions, his engagement averaged 9%. When initiation training was implemented, his engagement during intervention remained high at an average of 86% and his engagement during generalization rose to an average of

61%. In addition, in a three-month follow-up probe, Daniel remained engaged with peers during 100% of the intervals. Similarly, Ryan did not engage with any peers at baseline, but spent 80% of intervals engaged with peers during intervention sessions in the social intervention without initiations training condition. However, his rates of engagement during the generalization sessions remained low at 6%. In the social intervention with initiations training condition, his engagement during intervention remained high at 93% and his engagement during generalization rose to 84%. Similarly, Liana showed minimal or no interaction with peers during baseline, with an average of 4% of intervals engaged. With the onset of the social intervention with initiations training, her engagement rose to 72% during intervention sessions and 39% during generalization sessions.

Data for unprompted peer-directed initiations (during a 10-minute probe) are presented in Figure 2. For all three children, there were minimal or no unprompted initiations during baseline. Daniel and Ryan made more unprompted initiations during the intervention sessions of the social intervention without initiations training condition, but their initiations during generalization sessions remained in baseline range. In contrast, in the social intervention with initiations training there were increased (unprompted) initiations during both intervention and generalization sessions for all three children. Daniel's unprompted initiations remained high at the three-month follow-up.

Specifically, Daniel averaged 1.33 initiations during baseline, which rose to an average of 2.7 unprompted initiations during intervention sessions in the social intervention without initiations training condition. However, during generalization sessions, Daniel continued to display low numbers of unprompted initiations, averaging 0.3. After social intervention with initiations training, Daniel's average number of unprompted initiations in intervention sessions rose to 16.9, and his average number in generalization probes rose to 6.3. He made 12 unprompted initiations in a follow-up probe taken three months post-intervention. Similarly, Ryan made no unprompted initiations during any baseline sessions. He averaged 2.2 unprompted initiations during intervention sessions of the social intervention without initiations condition but made no initiations during generalization sessions in this condition (i.e. when no interventionist was present). Following the initiations training, Ryan's average number of unprompted initiations rose to 7.3 during intervention and 1.9 during generalization. Liana also had low levels of initiations during baseline, averaging 0.9. After the initiations intervention commenced, her unprompted initiations increased to an average of 10.2 during intervention and 8.1 during generalization. Thus, all three children showed generalized increases in unprompted initiations once initiation training was implemented.

Data for affect are presented in Figure 3. All three children displayed mostly negative affect, or occasionally neutral affect, during baseline sessions. However, during the social intervention without initiations training condition, Daniel and Ryan's average affect rose from baseline levels during intervention, but remained low during generalization. In the initiations condition, all three children's average affect in both intervention and generalization probes was consistently in the positive range.

Specifically, Daniel's affect was negative in two baseline probes and neutral in one probe. During the social intervention without initiations condition, his affect was positive or neutral with the exception of one probe when it was negative. Daniel's affect remained negative and neutral throughout generalization of that first condition. During the initiations condition, Daniel's affect was positive, with the exception of three of the sixteen probes when his affect was neutral. During the generalization probes in the initiations condition, his affect was positive during nine probes, with three in the neutral range. His affect remained positive at a three-month follow-up probe. Ryan's affect was negative in all baseline sessions. His affect during the intervention sessions of the social intervention without initiations training

condition was primarily neutral, while his affect during generalization was negative or neutral. However, following implementation of the initiations condition, Ryan's affect in intervention and generalization rose into the positive range and remained positive for the duration of the study. Liana's affect during baseline was negative with the exception of one neutral probe. During initiations training, her affect was primarily positive during the intervention sessions and in the neutral to positive range during generalization.

Effect Size

Cohen's *d* was used to calculate effect size in this study (Cohen, 1988). A .8 is considered a large effect size, .5 a medium, and .2 a small effect size. Effect size was calculated by comparing baseline data to data from the generalization condition of the social intervention without initiations condition.

For peer social engagement, effect sizes for Daniel, Ryan, and Liana were 2.5, 4.9, and 1.2, respectively. These indicate very large effects of the intervention on this dependent measure. For unprompted initiations, effect sizes were 1.1, 1.2, and 1.2, again indicating a large effect. Similarly, for affect, high effect sizes of 4.2, 4, and 4.3 were found. All data show that the intervention had a large effect on all dependent measures for all participants.

Discussion

Long-term outcomes for individuals with ASD, even those labeled as “high-functioning” are poor in regard to socialization, which affects intimate relationships, the risk of psychiatric illness, employment, and independent living (Howlin, 2000). Thus, this area is in critical need of research (Koegel & Lazebnik, 2009). A most pressing issue is the lack of generalization of social interventions effects (Bellini, Peters, Benner, & Hopf, 2007). The data from this study show that targeting initiations during a socialization intervention at recess can lead to gains in peer social engagement, unprompted peer-directed initiations, and positive affect that are maintained in the absence of an interventionist. The design also suggests that the initiation training does not need to be preceded by a facilitated play condition and targeting initiations immediately may be sufficient to lead to such gains. This is particularly important, as the majority of children with ASD do not have consistent interventions at recess and may not be provided with many social communicative opportunities throughout the school day (Chiang, 2009). Therefore, this type of intervention may be a low-investment and high-output intervention resulting in generalized gains. These findings are a further addition to the literature on naturalistic socialization intervention and also address the need for research specifically targeting generalization of socialization (Bellini, Peters, Benner, & Hopf, 2007).

There are a few weaknesses in the study. Although it added some methodological strengths to the study, some researchers in the field are less comfortable when some participants are involved in the study non-concurrently, and Liana's sessions were conducted non-concurrently. Following the success of Daniel and Ryan's intervention, we wanted to assess whether the Social Intervention without Initiations was a necessary component for success in the Social Intervention with Initiations Phase. The data suggest that the Initiations training may be successfully implemented immediately after baseline. Further, all participants were in the early elementary school grades. Further research relating to whether the intervention would also be effective for older children would be interesting. Finally, all data were collected during one school year. Research assessing whether intervention sessions are necessary during subsequent school years when children are fully-included with a different mix of peers and activities may be fruitful.

While the participants in this study were only taught how to make initiations related specifically to starting, joining, continuing, ending, or switching playground games, our observations suggest there was also some limited generalization to non-game related initiations. Future research may wish to systematically expand the types of initiations taught to participants and track the use of each type. In addition, it may be interesting for future research to track the impact that such an intervention has on sustained contact with the same peers and potential resulting friendships. As friendships have been found to be a protective psychosocial factor, these effects could be quite meaningful to changing the trajectory of outcomes for children with ASD.

Acknowledgments

The authors would like to our express appreciation to Elizabeth Ponder, Camille Rozeira, Galina Nakamoto, Ashley Cardenas, Gwen Stephens, Tran Dinh, Rachel Yamada, Liza Fletcher, Lauren Sartorre, Arely Rivera, Amanda Deering, and Tiffany Yang for their assistance with data collection and analysis. This research was funded in part by generous donations from the Eli and Edythe L. Broad Center for Asperger's Research and from the National Institutes of Health research grant #DC010924 from NIDCD. We would also like to express our sincere appreciation to the families that participated in this research.

Drs. Robert and Lynn Koegel are partners in Koegel Autism Consultants, LLC, a private company.

References

American Psychiatric Association. Diagnostic and statistical manual of mental disorders. Revised 4th ed.. Author; Washington, DC: 2000.

Anderson A, Moore DW, Godfrey R, Fletcher-Flinn CM. Social skills assessment of children with autism in free-play situations. Autism. 2004; 8:369–385. [PubMed: 15556957]

Bauminger N, Solomon M, Aviezer A, Heung K, Brown J, Rogers SJ. Friendship in high-functioning children with autism spectrum disorder: Mixed and non-mixed dyads. Journal of Autism and Developmental Disorders. 2008; 38:1211–1229. [PubMed: 18058212]

Burgess K, Wojslawowicz J, Rubin K, Rose-Krasnor L, Booth-LaForce C. Social information and coping styles of shy/withdrawn and aggressive children: Does friendship matter? Child Development. 2006; 77:371–383. [PubMed: 16611178]

Bellini S, Peters JK, Benner L, Hopf A. A meta-analysis of school-based social skills interventions for children with autism spectrum disorders. Remedial and Special Education. 2007; 28:153–162.

Chiang H-M. Naturalistic observations of elicited expressive *communication* of children with autism: An analysis of teacher instructions. Autism. 2009; 13:165–178. [PubMed: 19261686]

Church C, Alinsanski S, Amanullah S. The social, behavioral, and academic experiences of children with Asperger syndrome. Focus on Autism and other Developmental Disabilities. 2000; 15:12–20.

Cohen, J. Statistical power analysis for the behavioral sciences. Lawrence Erlbaum Associates, Inc.; Hillsdale, NJ: 1988.

Gresham FM, Sugai G, Horner RH. Interpreting outcomes of social skills training for students with high-incidence disabilities. Teaching Exceptional Children. 2001; 67:331–344.

Harper CB, Symon JBG, Frea WB. Recess is time-in: Using peers to improve social skills of children with autism. Journal of Autism and Developmental Disorders. 2008; 38:815–826. [PubMed: 17874290]

Howlin P, Goode S, Hutton J, Rutter M. Adult outcome for children with autism. Journal of Child Psychology and Psychiatry. 2004; 45:212–229. [PubMed: 14982237]

Hume K, Bellini S, Pratt C. The usage and perceived outcomes of early intervention and early childhood programs for young children with autism spectrum disorder. Topics in Early Childhood Special Education. 2005; 25:195–207.

Hwang B, Hughes C. The effects of social interactive training on early social communicative skills of children with autism. Journal of Autism and Developmental Disorders. 2000; 30:331–343. [PubMed: 11039859]

Krasney L, Williams BJ, Provencal S, Ozonoff S. Social skills interventions for the autism spectrum: essential ingredients and a model curriculum. Child and Adolescent Psychiatric Clinics in North America. 2003; 12:107–122.

Koegel L, Koegel R, Frea W, Fredeen R. Identifying Early Intervention Targets for Preschoolers with Autism in Inclusive School Settings. Behavior Modification. 2001; 25:745–761. [PubMed: 11573338]

Koegel LK, Koegel RL, Shoshan Y, McNerney E. Pivotal response intervention II: Preliminary long-term outcomes data. Journal of the Association for Persons with Severe Handicaps. 1999; 24:186–198.

Koegel, L.; LaZebnik, C. Growing Up on the Spectrum: A Guide to Life, Love, and Learning for Teens and Young Adults with Autism and Asperger's. Viking/Penguin; New York: 2009.

Koegel LK, Vernon TW, Koegel RL, Koegel BL, Paullin AW. Improving socialization between children with Asperger's disorder and their peers in full-inclusion community and elementary school settings. Journal of Positive Behavior Interventions. in press.

McConnnell SR. Interventions to facilitate social interaction for young children with autism: Review of available research and recommendations for educational intervention and future research. Journal of Autism and Developmental Disorders. 2002; 32:351–372. [PubMed: 12463515]

Rao PA, Beidel DC, Murray MJ. Social skills interventions for children with Asperger's Syndrome or High-Functioning Autism: A review and recommendations. Journal of Autism and Developmental Disorders. 2007; 38:353–361. [PubMed: 17641962]

Rogers SJ. Interventions that facilitate socialization in children with autism. Journal of Autism and Developmental Disorders. 2000; 30:399–409. [PubMed: 11098875]

Wainscot JJ, Naylor P, Sutcliffe P, Tantan D, Williams JV. Relationships with peers and the use of the school environment of mainstream secondary school pupils with Asperger Syndrome (High-Functioning Autism): A Case-Control Study. International Journal of Psychology and Psychological Therapy. 2008; 8:25–38.

Yeargin-Allsopp M, Rice C, Karapurkar T, Doernberg N, Boyle C, Murphy C. Prevalence of autism in a US metropolitan area. Journal of the American Medical Association. 2003; 289:49–55. [PubMed: 12503976]

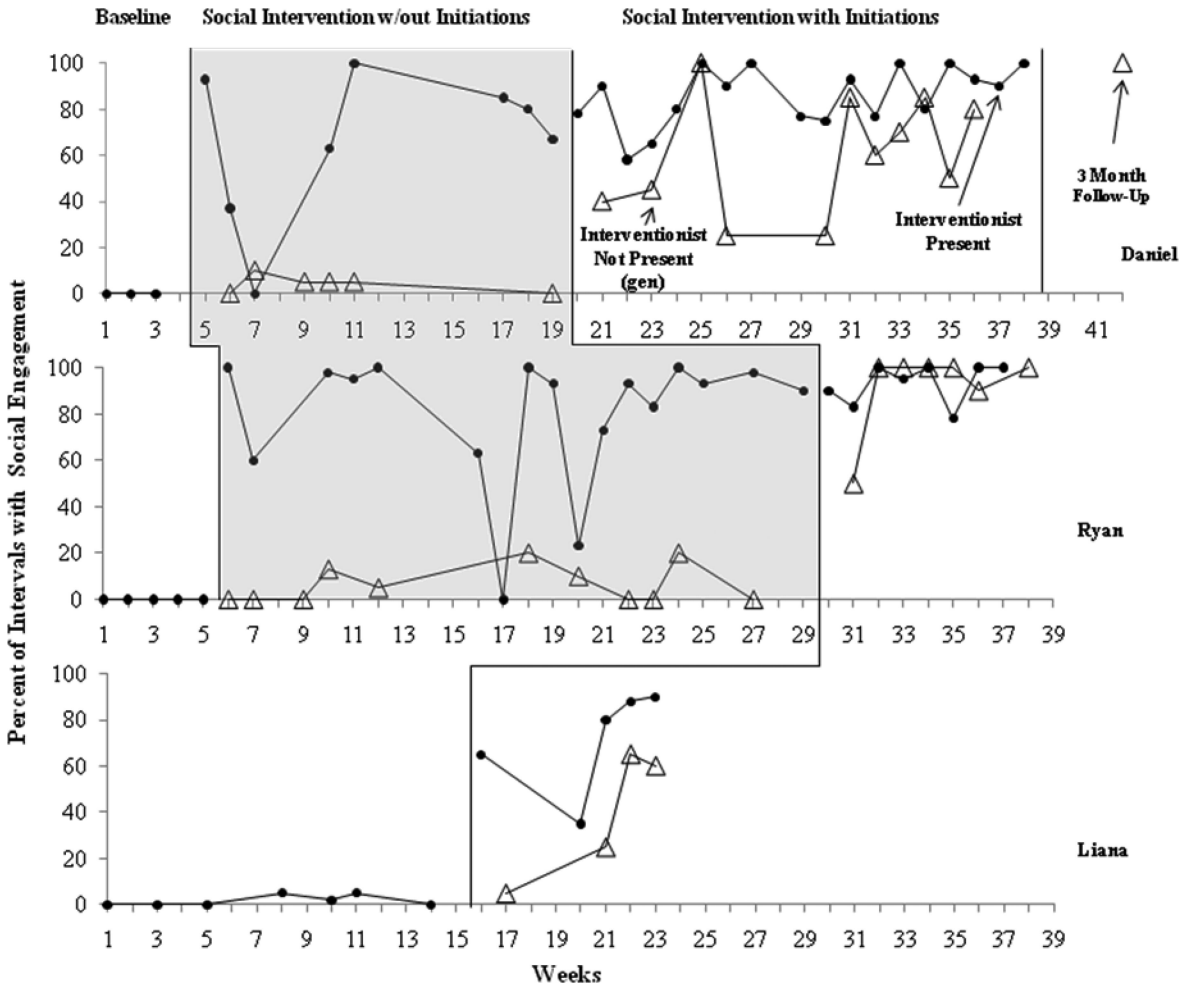

Figure 1.

Figure 1 shows the percentage of 30 second intervals the participants engaged in social behavior with their typically developing peer(s).

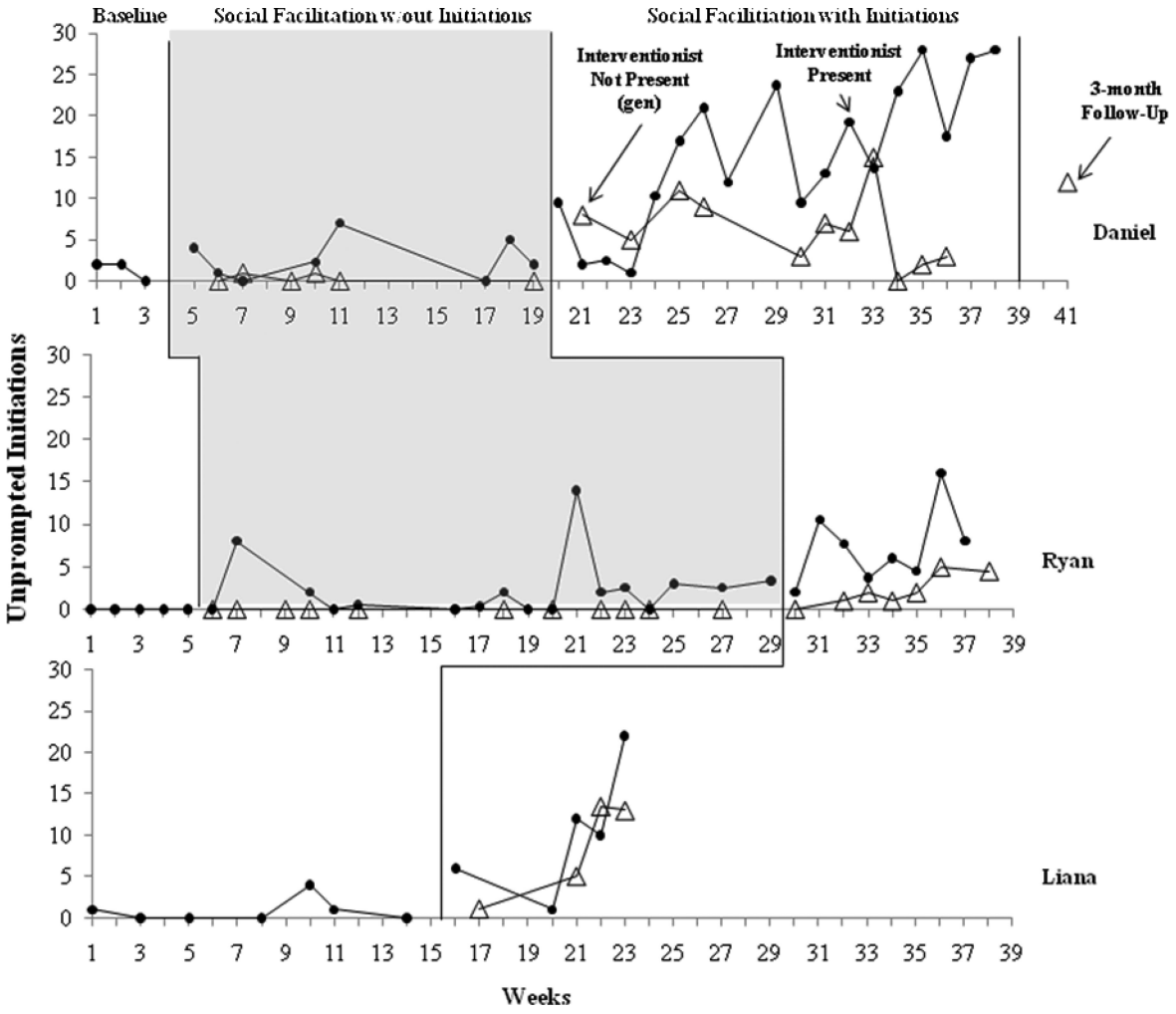

Figure 2.

Figure 2 shows the number of unprompted initiations directed at typical peers made by the participants during 10 minute probes.

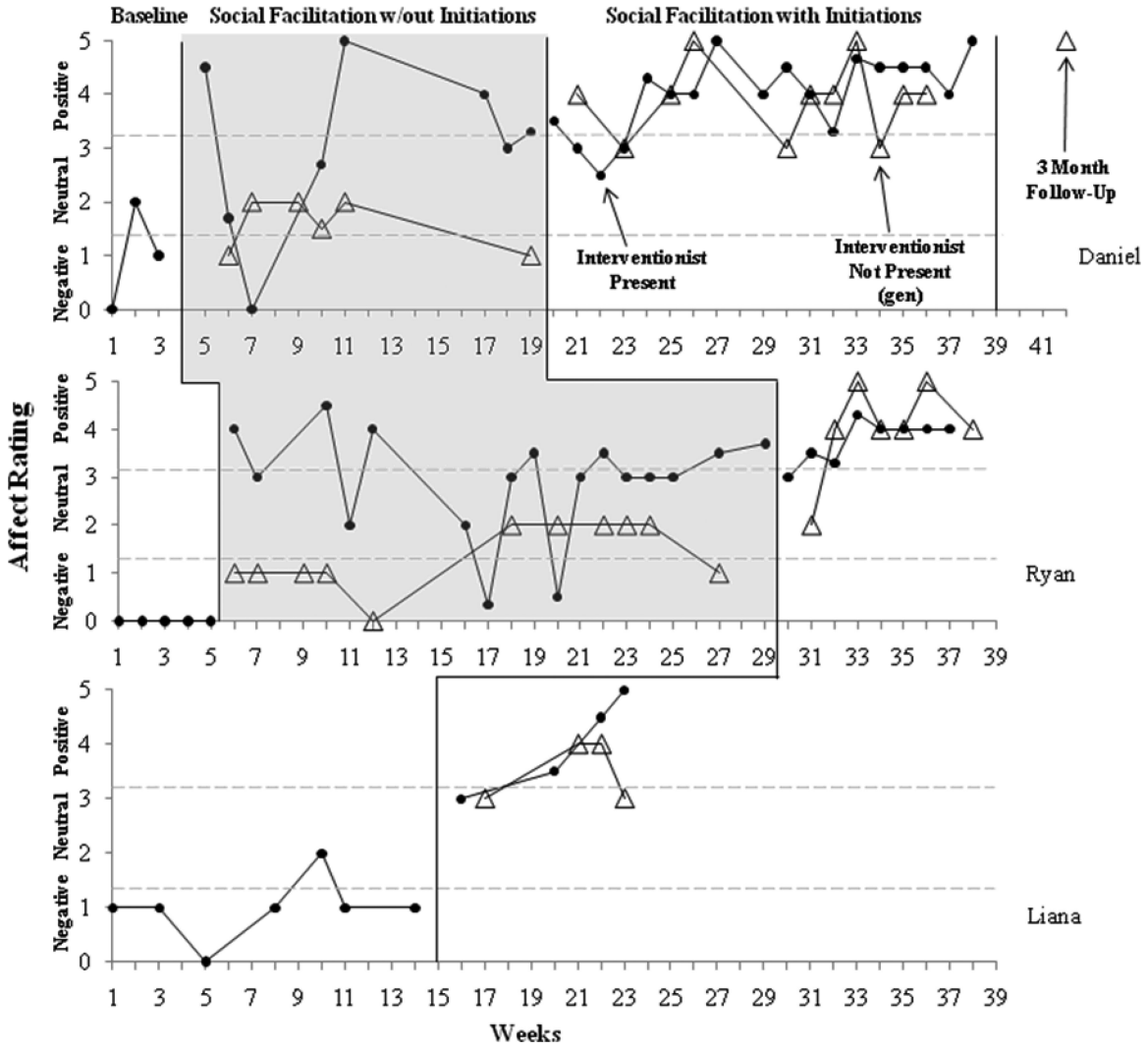

Figure 3.
Figure 3 shows the affect ratings for each participant. A rating of 0-1 indicates low affect, 2-3 indicates neutral affect, and 4-5 indicates high affect.

Table 1

Scale for rating child's affect, adapted from Koegel and Egel (1979)

Negative affect (0-1)	Neutral affect (2-3)	Positive affect (4-5)
Child looks bored, uninvolved, and not curious or eager to participate in the activity with peers. Appears to be sad, angry, or frustrated. Spends little time attending to activities and peers and may be noncompliant (shows inappropriate verbal or motor behavior, runs away). May engage in disruptive behaviors (throws tantrum, runs away, shows aggression). Score 0 or 1, depending on the extent of un-involvement and disruptive behavior.	Child is neither particularly interested nor uninterested in the activity or peers. May smile or frown occasionally, but overall seems neutral. May fidget and appear inattentive, but is not aggressive or rebellious. Generally complies with instructions or responds to prompts, but may not do so readily. Score 2 or 3, depending on the extent of compliance and attentiveness.	Child readily attends to the activity or peers and seems to be enjoying him- or her-self. May smile, laugh, or show other positive emotional behavior under appropriate circumstances. Child is alert and involved with the activity and with peers. Child responds to prompts or instructions, is compliant, and appears to try to perform successfully. Score 4 or 5, depending on extent of enjoyment and involvement.