

# Improving Socialization for High School Students with ASD by Using Their Preferred Interests

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**Abstract** There has been a paucity of research on effective social interventions for adolescents with autism spectrum disorders (ASD) in inclusive high school settings. The literature, however, suggests that incorporating the student with ASD's special interests into activities may help improve their socialization with typical peers. Within the context of a multiple baseline across participants design, we implemented lunchtime activities incorporating the adolescent with ASD's preferred interests that were similar to ongoing activities already available at the schools. Results showed this increased both level of engagement and their rate of initiations made to typical peers. Social validation measures suggest that both adolescents with ASD and typical peers enjoyed participating in these activities and that the results generalized to other similar activities.

**Keywords** Social · High school · Autism spectrum disorders · Inclusion

## Introduction

The prevalence and incidence of individuals diagnosed with autism spectrum disorders (ASD) throughout the

world has dramatically increased (Centers for Disease Control and Prevention 2009; National Institute of Mental Health 2008; Koegel and Koegel 2006; Filipek et al. 1999; Fombonne 2003; Rutter 2005; McDonald and Paul 2009; Newschaffer et al. 2005), and consequently, schools are in need for interventions that target socialization for these students (Brown et al. 2001; Koegel et al. 2009).

While effective socialization intervention programs have been described for young students with ASD (Rogers 2000; McConnell 2002; Matson et al. 2007), such as peer support networks (Haring and Breen 1992; Garrison-Harrell et al. 1997), circle of friends (Kalyva and Avramidis 2005; Barton et al. 2011; Whitaker et al. 1998), buddy systems (Laushey and Heflin 2000), and lunch clubs (Baker et al. 1998; Koegel et al. 2012a, b), relatively few intervention models or programs target high school students with ASD (Bellini et al. 2007; Tse et al. 2007). This is a growing concern as more and more children with autism reach their high school years.

Research has documented that without systematic social intervention, adolescents with ASD can exhibit limited or nonexistent initiations toward typical peers (Hughes et al. 2011), difficulty maintaining engagement with typical peers (Humphrey and Symes 2011), a general lack of social competence around typical peers (Stichter et al. 2007; Knott et al. 2006), and an overall difficulty appropriately participating in social activities with typical peers (Ormond et al. 2004).

Unfortunately, this lack of socialization has negative effects on the reported emotions of students with autism. That is, adolescents with ASD report feelings of loneliness (Lasgaard et al. 2010; Locke et al. 2010) and express a desire to have more meaningful friendships (Beresford et al. 2007). What is especially alarming is that these social

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impairments increase the risk that adolescents with ASD will develop co-morbid disorders, most commonly anxiety and/or depression. For example, Simonoff et al. (2008) found that individuals with ASD are up to 29.2 % more likely to develop a co-morbid diagnosis of social anxiety compared to the general population. Additionally, Strang et al. (2012) found that 30 % of their sample was in the clinical range for depression which is a much higher rate than is experienced in the general population.

Several studies suggest promising intervention models that are aimed at ameliorating social deficits for elementary and middle school students with ASD. For example, Koegel et al. (2011) and Koegel and Koegel (2006) recommend incorporating the student with ASD's interests into activities in order to increase their motivation to participate in these social activities. In addition, Koegel et al. (2012a, b) found that implementing activities that incorporated junior high school students with ASD's preferred interests improved their socialization with typical peers.

The purpose of the present study, therefore, was to extend this line of research aimed at improving the socialization of high school students with ASD. Our goal was to improve adolescents with ASD's engagement with typical peers, initiations made to typical peers, and their overall affect during social activities in an inclusive high school setting by incorporating their preferred interests. In addition, we assessed whether the newly acquired socialization skills would generalize or maintain after the completion of the intervention.

## Methodology

### Participants

Seven high school students with a diagnosis of ASD participated in this study. All participants were diagnosed by independent agencies with expertise in autism and all had a diagnosis of ASD listed on their IEPs. Further, the diagnosis was confirmed by staff from our center using the DSM-IV-TR criteria (APA 2000). School psychologists referred the adolescents for participation in this study due to observed difficulties socializing appropriately with typical peers during lunchtime in their high school settings. The adolescents were between the ages of 14–16 years at the start of the study. In order to ensure feasibility for introducing the social intervention at various times during the school year, we included two cohorts. The first cohort, comprised of 4 adolescents, began during the spring semester when friendships among peers were already developed. The second cohort, comprised of 3 adolescents, began during the fall semester when friendships among peers were still developing.

In addition to the adolescents with ASD participating in the intervention between 7 and 24 typically developing peers attended each club activity.

### Cohort 1

Four adolescents were included in the first cohort. Three of the participants were Hispanic and one was Caucasian. All four attended public high school and were fully included in all classes.

Participant 1 was a 14-year old boy in the 9th grade. Teachers and Special Education staff reported that Participant 1 functioned at grade level academically, but was seriously socially isolated. During the beginning of the school year, his parents considered transferring him to a smaller high school because he did not socialize with peers and appeared very depressed. Prior to intervention, he sat by himself during lunchtime and never socially interacted with typical peers.

Participant 2 was a 16-year old boy in the 10th grade. Teachers and Special Education staff reported that Participant 2 functioned slightly below grade level due to inappropriate behaviors and reported that he had difficulty socializing and maintaining personal relationships with typical peers. Prior to intervention, although Participant 2 made some attempts to socially interact with typical peers, his overall level of engagement and frequency of initiations were low compared to his typical peers. Further, he was reported to display higher social competence with teachers, and also with peers on the autism spectrum, suggesting he did socialize, but not with typical peers.

Participant 3 was a 15-year old boy in the 10th grade. Teachers and Special Education staff reported that in addition to functioning ~1 year below his current grade level academically, Participant 3 had difficulty socializing with typical peers. Prior to intervention, Participant 3 sometimes sat or stood in too close proximity to typical peers, and despite being physically close to typical peers there were no observed social interactions. In addition, Participant 3 was reported to spend some of his lunchtime periods socially engaged with students on the autism spectrum, but not with typically developing peers.

Participant 4 was a 16-year old boy in the 11th grade. Teachers and Special Education staff reported that Participant 4 functioned ~2 years below grade level academically and that he engaged in limited social interaction with his typical peers. Prior to intervention, typical peers were observed to frequently tease and ridicule Participant 4 during lunchtime.

### Cohort 2

Three participants diagnosed with Autism Spectrum Disorder were included in the second cohort. One of the

participants was Hispanic, and two of the participants were half Caucasian and half Hispanic. All three participants attended public high school and were fully included in all classes.

Participant 5 was a 16-year old boy in the 11th grade. Teachers and Special Education staff reported that Participant 5 functioned at grade level academically, but they were concerned with his lack of socialization with typical peers. He was new to the school, as his parents had moved to the area in the beginning of the school year. Prior to intervention, Participant 1 ate lunch by himself. When he finished eating lunch he went to the basketball courts and played by himself unless a peer initiated a game. On the occasions when a peer initiated a game, although he participated in the activity, he did not engage in social-verbal interactions, and other than an occasional basketball game, he exhibited no other social interactions with his typical peers.

Participant 6 was a 15-year old boy in the 9th grade. Teachers and Special Education staff reported that Participant 6 functioned at grade level academically, but they were seriously concerned about his lack of socialization with typical peers. They reported that he was frequently and repeatedly teased and bullied. During baseline, Participant 6 made some attempts to socially interact with his typical peers, but his typical peers teased and bullied him, and as a result, he did not engage in any appropriate social interactions.

Participant 7 was a 15-year old girl in the 9th grade. Teachers and Special Education staff reported that Participant 7 functioned below grade level academically and that she was socially inappropriate with typical peers. Prior to intervention Participant 7 generally sat next to students with disabilities during lunchtime and when she made attempts to interact with typical peers, these attempts were inappropriate. As a result, Participant 7 was either bullied or ignored by her typical peers. Participant 7 was required by the school psychologist to attend a once weekly “Social Club” (that did not include her preferred interests of cooking) during lunch periods. Although the “social club” was intended to provide an opportunity for students with disabilities to interact with typical peers, there was no structure or direction on how they would achieve this, and few typical peers attended the meetings.

### Settings

The study took place at local high schools. Socialization opportunities that incorporated the adolescent with ASD’s preferred interests were implemented during lunchtime, either in regular education classrooms on the campus or outside on the school’s main lawn or basketball court, depending on the space needed for each particular activity.

### Dependent Measures

Data were collected on parameters of social interaction frequently measured in the literature (c.f., Koegel et al. 1999): (a) the adolescent with ASD’s *percent time engaged* with typical peers; (b) the *frequency of initiations* the adolescent with ASD made to typical peers; and (c) *social validation measures* regarding the intervention through a self-report measure that participants completed. All intervention sessions were videotaped, and data for percent time engaged with typical peers were scored from the videotaped sessions. The rate of verbal initiations were collected in vivo by an observer who was close enough to hear the content of the verbal interaction. Data for the social validation measures were obtained by providing a short survey questionnaire to both the target adolescents and typical peers relating to their participation and experience in the intervention. Data were collected by a graduate student majoring in special education and a BA level observer, both of whom had prior experience with data collection.

*Percent intervals engaged* was recorded using a 1-min interval recording. For each interval, a plus or minus was scored to denote the presence or absence of social engagement. At the end of each session, the total number of pluses was divided by the total number of intervals of the session and multiplied by 100 to yield a percentage of social engagement per session. Engagement was defined according to previous published reports (Koegel et al. 2012a, b), and consisted of the target adolescent’s appropriate use of at least 3 of the following for 3 or more consecutive seconds: facing peers, making eye contact, gesturing (e.g., pointing, high-fiving, fist pounding), responding to questions, asking questions, making comments, smiling, nodding, and/or sharing of activities or materials with peers during the interval.

*Rate of initiations* was recorded by tallying each independent spontaneous verbal social communicative interaction the target adolescent directed toward another peer without being prompted. Appropriate initiations included requests, questions, or comments made to typical peers that elicited additional information pertaining to the current conversational topic. Additionally, these initiations were not taught to the adolescents during the time frame of the study, and were not preceded by a prompt or instruction to speak. At the end of each session, the total number of tallies was divided by the length of the session, to yield a rate of initiation per minute.

*Social validation measures of self-reports* relating to the intervention were recorded by surveying both adolescents with ASD and typical peers. There were a total of 7 items for cohort 1 and 6 items for cohort 2 on the survey. For example, students were asked, their reason for attending the Club and how attending the Club made them feel. Tables 1 and 2 list the items that were asked on the survey.

**Table 1** Survey items from cohort 1

Survey questions	Response from target adolescent from movie club	Modal response from typical participants from movie club	Response from target adolescent from Frisbee club	Modal response from typical participants from Frisbee club	Response from target adolescents from video game club (two participants)	Modal response from typical participants from video game club
Reason for attending_club	“To make friends”	“Its fun”	“Having fun”	“Fun”	“For fun” and “Just for fun”	“Fun”
How does attending_club make you feel	“Happy”	“Happy”	“Like I have a lot of energy”	“Happy”	“Like I have friends” and “Great”	“Excited” “Competitive”
I’ve made new friends from_club (yes or no)?	Yes	Yes	Yes	Yes	Yes	Yes
If yes, can you name at least two friends?	“Austin” “Luke”	“Billy”	“Ben”	Most of the students were nominated as a new friend at least once	“Jackson” and “Frank”	“Jack” “Tyler”
The best part about_is?	–	–	“Meeting new people”	“Its fun” “Playing Frisbee”	“To have fun” and “Winning”	“Winning”
Suggestions to improve_club	“Ask questions about specific movies”	“Make it longer”	“Make advertisements to bring more people”	“More people”	“Team battles” and “Better skills”	“Better referees” “More regulations”

## Reliability

Two observers, one graduate student and one undergraduate student, independently recorded data for 30 % of all sessions across all conditions. Reliability was calculated by the number of agreements divided by the total number of agreements plus disagreements times 100.

For percent intervals engaged, agreements were defined as the observers recording identical marks (i.e., plus or minus) for each 1-min interval throughout the approximately 30 min of lunchtime. Disagreements were defined as the observers having a different mark for a 1-min interval. From the first cohort, the average percent agreement for Participant 1 was 95 %, ranging from 82 to 100 %. The average percent agreement for Participant 2 was 90 %, ranging from of 85 to 100 %. The average percent agreement for Participant 3 was 88 %, ranging from 82 to 96 %. The average percent agreement for Participant 4 was 92 %, ranging from 82 to 100 %. For the second cohort, the average percent agreement for Participant 5 was 96.3 % ranging from 89 to 100 %. The average percent agreement for Participant 6 was 88 %, ranging from of 82 to 96 %. The average percent agreement for Participant 7 was 94.5 %, ranging from 83 to 100 %.

For rate of initiation, agreements were defined as the observers recording the same number of initiations in each minute throughout the approximately 30 min of lunchtime.

Disagreements were defined as the observers recording a different number of initiations in a given minute for any specific session. From the first cohort, the average percent agreement for Participant 1 was 98 %, ranging from 93 to 100 % across sessions. The average percent agreement for Participant 2 was 88 %, ranging from 80 to 100 % across sessions. The average percent agreement for Participant 3 was 90 %, ranging from 86 to 94 % across sessions. The average percent agreement for Participant 4 was 92 %, ranging from 83 to 100 % across sessions. For the second cohort, the average percent agreement for Participant 5 was 84.6 %, ranging from 80 to 88 %. The average percent agreement for Participant 6 was 86.3 %, ranging from of 80 to 96 %. The average percent agreement for Participant 7 was 93.3 %, ranging from 83 to 100 %.

## Research Design

A repeated measures multiple baseline across participants experimental design was employed (Barlow and Hersen 1984; Bailey and Burch 2002). Probes were collected one to two times per week per participant throughout the study. Systematically staggered baselines of 4, 7, 10, and 13 probes were recorded for cohort 1 and systematically staggered baselines of 2, 6, and 8 probes were recorded for cohort 2.

**Table 2** Survey items from cohort 2

Survey questions	Response from target adolescent from Basketball Club	Modal response from typical participants from Basketball Club	Response from target adolescent from Computer Graphics Club	Modal response from typical participants from Computer Graphics Club	Response from target adolescents from Cooking Club	Modal response from typical participants from Cooking Club
Reason for attending_club	“To play ball”	“I like to play”	“Because it’s fun”	“I love graphic design”	“I love cooking”	“Learn how to cook”
How does attending_club make you feel	“Good” “Fun”	“Good” “Happy” and “Energetic”	“Happy”	“Happy”	“Happy”	“Happy”
I’ve made new friends from_club (yes or no)?	No	Yes	No	No	Yes	Yes
If yes, can you name at least two friends?	–	“Issac”	–	The target adolescent was the modal nomination from typical peers	“Michelle”	“Karen” “Jill” and target adolescent was also the modal nomination from typical peers (Michelle was one of the peers that nominated target adolescent)
The best part about_is?	“Playing in the gym?”	“Playing”	“Using AI”	“Creating logos”	“Fun to make new friends” “Fun and funny”	“Food”
Suggestions to improve_club	“Wish we could play in the gym every week”	“Should not get more people”	“None”	“More projects”	“Have friends come”	“None” regulations”

**Procedures**

*Baseline*

For both cohorts, our target adolescents were observed participating in their regular lunchtime activities during baseline. No changes were made to their respective lunchtime environments, nor were the participants given any prompts or additional instructions to interact with typical peers.

*Intervention*

After the baseline observations, each target adolescent was individually interviewed to assess what their preferred interests were in order to incorporate their interests into club activities during lunchtime. Although a variety of clubs were already available at the high schools and our participants had the option of joining these pre-existing clubs, none of these clubs incorporated the target adolescent’s preferred interests. Participants 1, 2, 5, and 6 did not attend any of these pre-existing clubs. Participants 3, 4, and

7 attended preexisting clubs but the club activities did not incorporate their preferred interests.

Similar to the pre-existing clubs, the new clubs were open to all students and were advertised via flyers, which were posted around the school, and given to various teachers to announce to their students. For some clubs, the target adolescents actively promoted the club to typical peers by passing out flyers in between classes and lunchtime. In addition, prior to the club meetings, the club was announced over the intercom right before lunch, reminding all students of the opportunity to join a club. The participants’ diagnoses were kept confidential throughout the study. As in the baseline condition, the students were never prompted to initiate to or engage with their typical peers. Likewise, the typically developing peers were not prompted to initiate to or engage with the target participants.

*Cohort 1*

Participant 1 expressed an interest in joining a movie club. Because the high school did not offer a movie club, a

Movie Trivia Club was formed that met Fridays during lunch in a classroom that was easily accessible for all students. Students were given the option to team up with 2–4 peers. The club facilitator, a graduate student specializing in special education, was responsible for playing an audio clip from a movie (clips were collected from a popular website, [Youtube.com](http://Youtube.com)) and asking the trivia questions. Although the club facilitator asked the trivia questions, students primarily mediated the club by interacting with one another. The first team that correctly guessed the movie clip was awarded a point. A pair of movie tickets was offered to the team that scored the most points by the end of the lunch period. On average, 15 typically developing students attended this club with a range between 10 and 22 students. There were a total of 8 club meetings and the club met once a week.

Participant 2 expressed interest in joining an Ultimate Frisbee club. The high school previously offered an Ultimate Frisbee club, but was unable to get participants to attend an initial meeting for club formation. The president of the club agreed to collaborate with the club facilitator, a graduate student specializing in special education, in order to seek more participants by announcing that the club was reforming and that pizza would be provided at the first meeting (pizza was not provided at any subsequent meetings). The club facilitator was only responsible for bringing the Frisbee and keeping score. The club president instructed club members to split into two teams in order to play Ultimate Frisbee. Once the teams were formed, students mediated the club by making sure all players were following the rules of Ultimate Frisbee. In addition, when students did not know how to play Ultimate Frisbee, other peers taught these students how to play the game. On average, 9 typically developing students attended this club with a range between 7 and 12 students. There were a total of 4 club meetings and the club met once a week.

Participant 3 and 4 both expressed an interest in joining an already existing Video Game Club, which met everyday during lunch. Participant 3 attended all club activities, while participant 4 was introduced to the club at a later time. The teacher who supervised the Video Game Club gave the club facilitator, a graduate student specializing in special education, permission to come in Wednesdays and Thursdays to run structured video game tournaments. The club facilitator was responsible for setting up the Wii console and recording the winning teams for the tournament. Rather than structuring the game only around the senior's interests, as was the case previously, all students voted to play a game (i.e., Super Smash Brothers) that was popular for the entire group including our participants on the Wii console. Students were given the option to find a partner for the tournament. Once again, students primarily mediated the club by making sure all club members were

not cheating when playing the game. In addition, students that did not know how to play Super Smash Brothers asked other peers how to play the game. A \$5 gift card to a video game store was offered to the team that won the tournament. For Participant 3 there were a total of 8 club meetings and for Participant 4 there were a total of 5 club meetings. For both clubs, there was an average of 20 typically developing students with a range of 14 and 24 students and the club met once a week for Participant 3 and once a week for Participant 4.

#### *Cohort 2*

Participant 5 expressed an interest in joining an Intramural Basketball club. Because the high school did not have an Intramural Basketball club, one was created that met Tuesdays during lunch at the outdoor basketball courts. Students were given the option to form teams comprised of 4–6 players. The club facilitator's role was to start the game by throwing the ball in the air and record the scores. Again, the peers primarily mediated the basketball games by making sure students were following the basketball rules (e.g., foul, travel). A \$5 gift card to a local smoothie store was offered to the team that scored the most points at the end of the lunch period. In addition, because students only had 30 min for lunch, club members were provided with Pizza in order to ensure students enough time to participate in the club activity. On average, 12 typically developing students attended this club with a range between 8 and 22 students. There were a total of 10 club meetings and the club met once a week.

Participant 6 expressed an interest in joining a Computer Graphics club. The high school did not offer a Computer Graphics club, thus a new club was formed that met every Wednesday at lunch in a classroom with computers. Participant 6 invited his peers from his classes and became the president of the club. The club facilitator, a graduate student specializing in special education, was responsible for contacting a local university to seek out logo requests from faculty, staff, and graduate students for a free logo design. Once the club facilitator received requests, the club facilitator relayed the message to Participant 6. Club members were given the option of working independently or with peer(s) when designing the requested logos. Once again, students primarily mediated the clubs by making sure all club members knew how to use the computer graphics program. When students did not know anything about computer graphics, they asked other peers how to use the program. A \$5–\$10 gift cards to either a local smoothie store or iTunes were offered to the students when students completed a requested logo. Similar to the Basketball club, because students only had 30 min for lunch, club members were provided with Pizza in order to ensure students

enough time to participate in the club activity. On average, 11 typically developing students attended this club with a range between 7 and 15 students. There were a total of 9 club meetings and the club met once a week.

Participant 7 expressed an interest in joining a Cooking Club. The high school did not provide a Cooking Club, thus a new club was formed that met every Monday at lunch in a classroom that was easily accessible to all students. Participant 7 became the president of the club, invited her peers from her classes, and made a video bulletin to announce the club to the entire school. The club facilitator, a graduate student specializing in special education, brought ingredients for students to make recipes that could be completed and consumed during the lunch period, such as pasta salad and smoothies. The club facilitator was responsible for asking students what recipes they wanted to make the following week and to ensure that students were following the school rules. Because the classroom did not have a stove or an oven, all the recipes were no bake recipes. Students primarily mediated the clubs by ensuring that all members participated in chopping vegetables and fruits, mixing the ingredients, and serving the products. Club members were given the option of working with peers or independently when cooking. On average, 13 typically developing students attended this club with a range between 10 and 16 students. There were a total of 6 club meetings that met once a week.

#### *Generalization and Maintenance*

Generalization data were collected for some participants while maintenance data were collected for other participants. The decision to collect either generalization or maintenance data was dependent on the school's continuation of the club activities in the absence of the facilitator. Specifically, following completion of the intervention, we noted whether the club continued to exist or was discontinued after the facilitator was no longer coordinating the clubs. If the school continued the club activities in the absence of the facilitator, we collected maintenance data on our dependent measures. However, if the school discontinued the club activities after the club facilitator no longer provided the activities, we collected generalization data on our dependent measures to assess socialization under different conditions. Similar to baseline measures, no changes were made to their respective lunchtime environments and students were not given any prompts or additional instructions to socialize with typical peers.

For cohort 1, generalization probes were collected for Participants 1 and 2 and maintenance probes were collected for Participants 3 and 4 (whose clubs continued) following intervention. For cohort 2, all clubs were discontinued

following intervention. Therefore, generalization probes were collected for all participants.

#### *Typical Peer Comparison Data*

Three to 4 typical peers from the club activity served to provide an estimate of the typical range of level of engagement and rate of initiations for the adolescents with ASD. Typical peer data were recorded in exactly the same manner as the data for the adolescents with ASD.

## **Results**

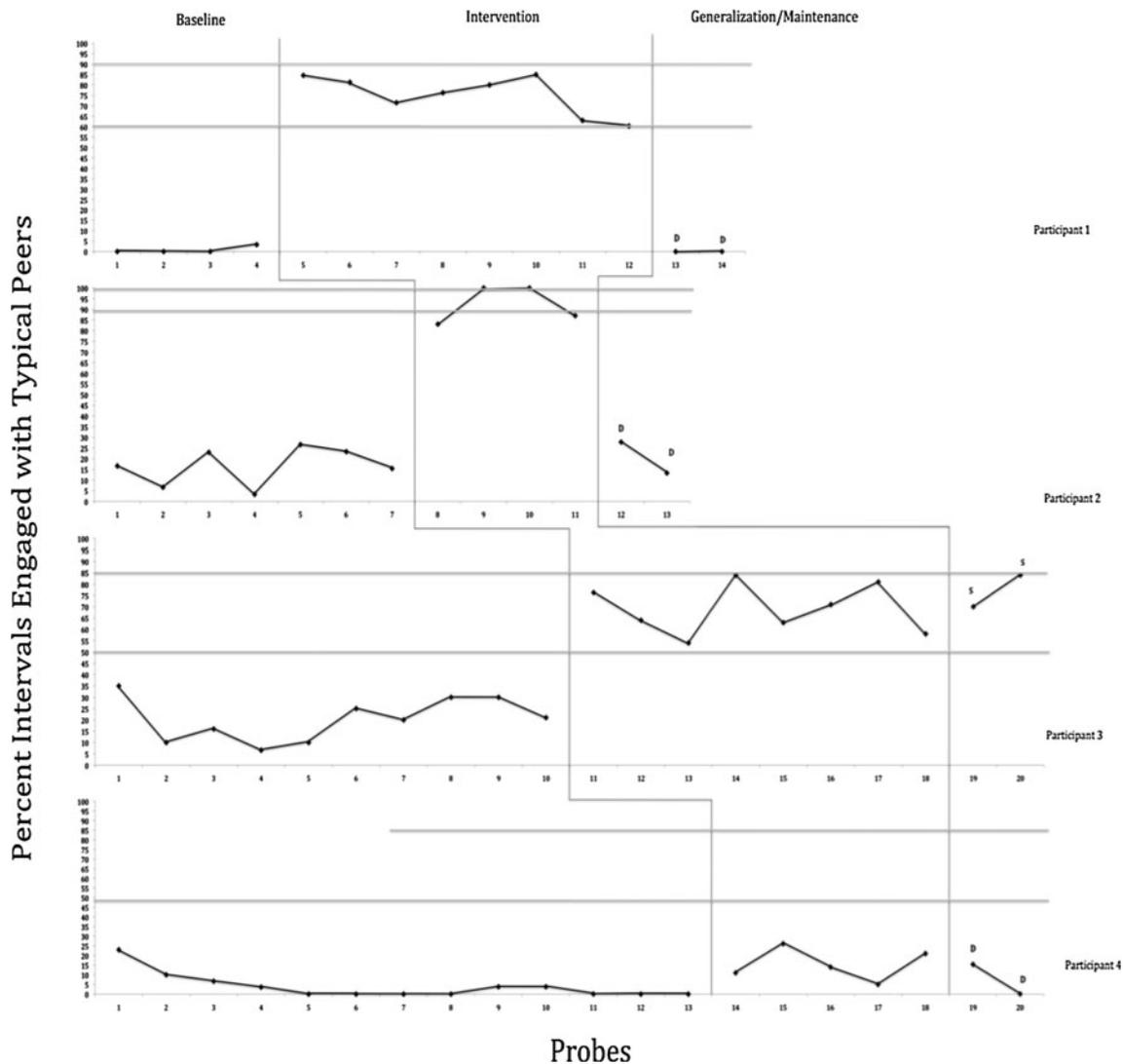
The results for cohort 2, who began in the fall semester, were similar to the results for cohort 1. This suggests that the time of the year the clubs formed is not an important distinction. As can be seen in Figs. 1 and 2, all participants from both cohorts were socially isolated when compared to typical peers during baseline, with low levels of engagement with typical peers during every baseline session. While numerous structured clubs were available for these adolescents to attend during baseline, the target adolescents typically did not attend any existing clubs. Furthermore, three students (Participants 2, 3 and 4) spent their lunch periods in isolation inside a classroom where other students were socializing with each other.

In contrast, all participants improved with intervention. Specific details for each measure are presented below.

### Level of Engagement

#### *Cohort 1*

Figure 1 shows that Participant 1 showed little to no engagement (0–3.3 %) with peers during the baseline sessions and was well below the typical level of engagement of his peers who showed engagement in more than 60 % of the intervals. During intervention, however, his level of engagement increased immediately, reaching the level of his peers (which ranged between 60 and 95 % and is reflected by the gray horizontal lines on the graph). He remained engaged between 60.3 and 85 % of the intervals throughout the condition. During generalization measures, Participant 1's level of engagement with typical peers dropped back down to zero. The "D" in the figure represents the fact that these generalization activities were highly dissimilar to the intervention club activities. For example, after the facilitator was no longer coordinating the Movie Trivia Club, the school did not offer any activities during lunchtime that were of Participant 1's interests. However, he did attend two afterschool movies with two peers who had been in the Movie Trivia Club.



**Fig. 1** Target adolescents' (from cohort 1) percent time engaged with typically developing peers. S indicates participant participated in a similar structured club activity that was already available at the

school during lunchtime and the D indicates participant participated in a different activity during lunchtime. The gray horizontal lines represent range in engagement for typical adolescents

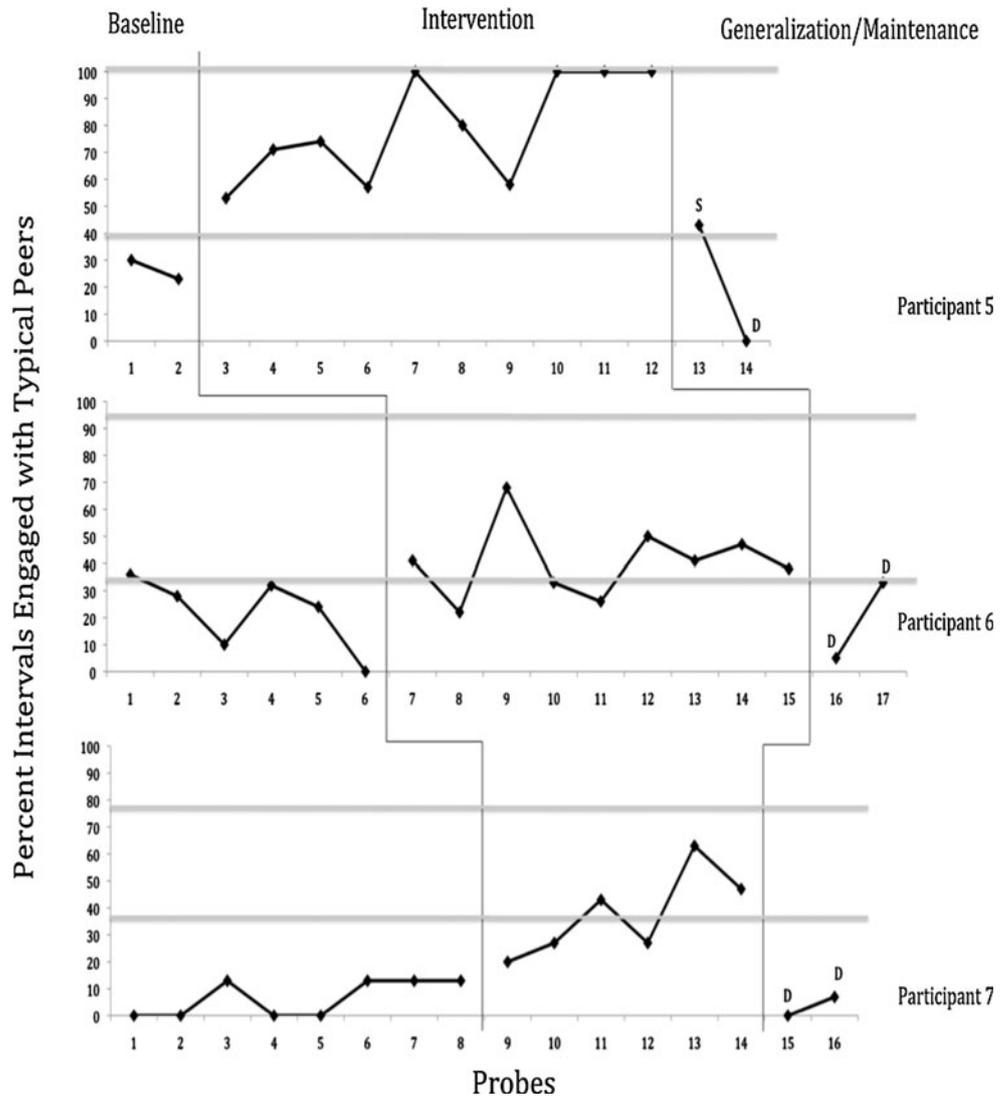
Both peers received reciprocated friendship nominations (see Table 1).

Although Participant 2 was somewhat engaged with typical peers during baseline between 6.6 and 26.6 % of the intervals, he was well below the range of his typical peers. Once intervention was implemented, his engagement level gradually improved, reaching between 87 and 100 %, remaining in the typical range (88–100 %). During generalization measures, Participant 2's level of engagement decreased back to baseline levels. Again, the "D" in the figure represents the fact that these generalization activities were highly dissimilar to the intervention club activities. For example, after the discontinuation of the Frisbee Club, Participant 2 returned to his lunchtime spot, which was in front of a computer, somewhat isolated from other peers (Figs. 3, 4).

Participant 3 was also somewhat engaged with typical peers in baseline, but he was also well below the range of his typical peers. Specifically, during the baseline condition, he was engaged with typical peers 3.3–26.6 % of the time interval. During intervention, participant 3 immediately reached the typical range of engagement (50–85 %) reaching between 54 % and 84 % of the intervals. During maintenance measures, Participant 3 maintained his level of engagement with his typical peers. The "S" in the figure represents the fact that these generalization activities were highly similar to the intervention club activities. After the completion of the intervention, students continued to maintain the video game club.

Participant 4 showed little to no engagement with typical peers during baseline. Specifically, he was engaged

**Fig. 2** Target adolescents’ (from cohort 2) percent time engaged with typically developing peers. S indicates participant participated in a similar structured club activity that was already available at the school during lunchtime and the D indicates participant participated in a different activity during lunchtime. The gray horizontal lines represent range in engagement for typical adolescents



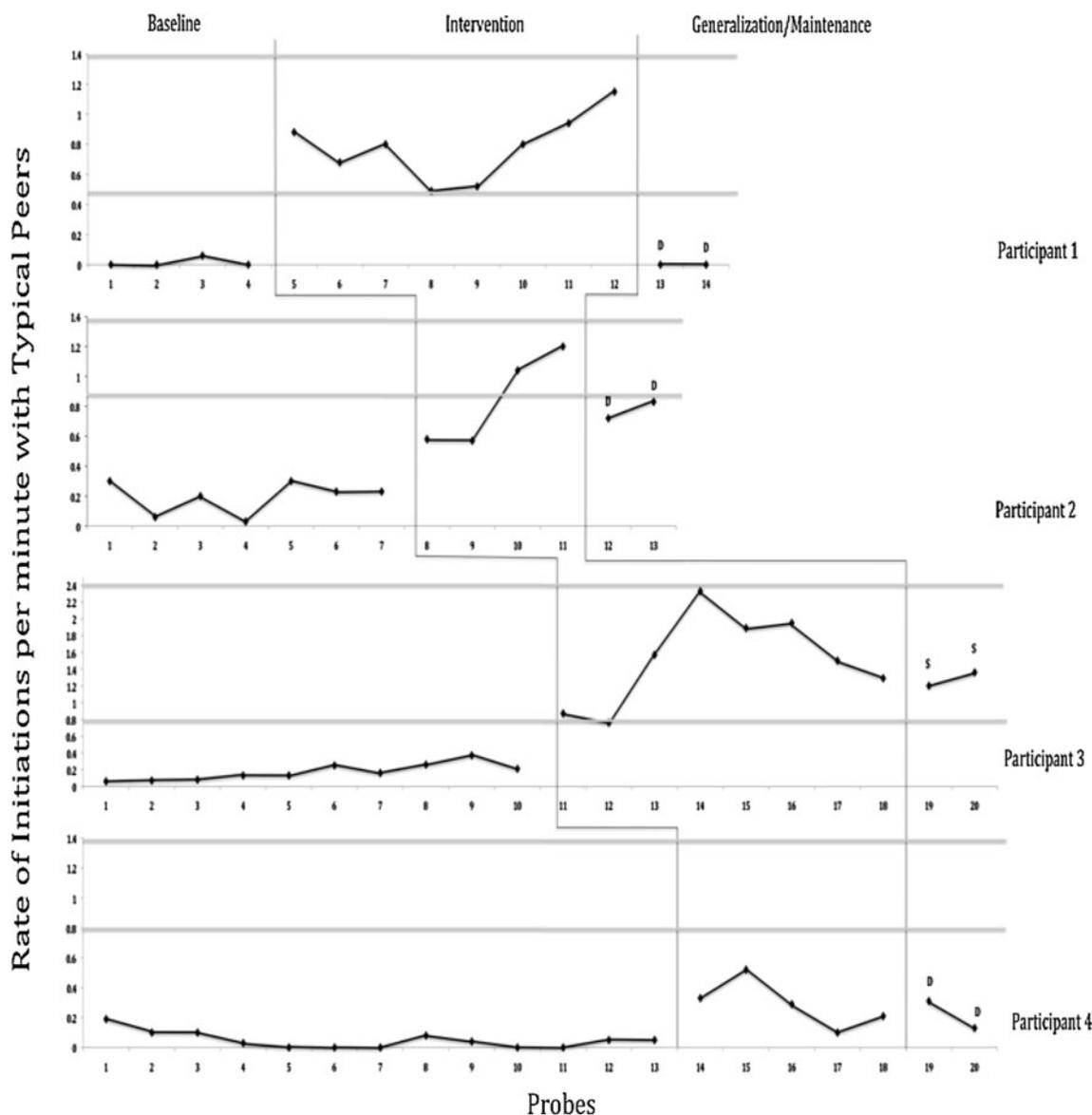
with his typical peers 0–23 % of the time interval during the baseline condition. Although his engagement during intervention was not within the range of his typical peers (50–85 %), his level of engagement was above most of the baseline sessions. That is, during intervention, he was engaged with his typical peers 5–26 % of the intervals. During generalization measures, Participant 4 exhibited some level of engagement during the first probe, but by the second probe, his level of engagement dropped back down to zero. Again, the “D” in the figure represents the fact that these generalization activities were highly dissimilar to the intervention club activities.

*Cohort 2*

Participant 5 was somewhat engaged with typical peers during baseline, between 23 and 30 % of the intervals,

but was below the level of his typical peers. During intervention, however, his level of engagement increased immediately, reaching the level of his peers (38–100 %). He remained engaged between 53 and 100 % of the intervals throughout the condition. During the first probe after the intervention ended, Participant 5 continued to play basketball with his peers (preferred but non-club activity). During that probe (characterized by an “S” for similar activity), his level of engagement was relatively high (43 %). In the second probe after the intervention ended, Participant 5 engaged in a variety of non-basketball activities. During that probe (characterized by a “D” for dissimilar activity) he exhibited zero intervals with engagement.

Participant 6 showed some engagement to no engagement with typical peers during baseline measures. Specifically, during baseline, he was engaged with typical peers



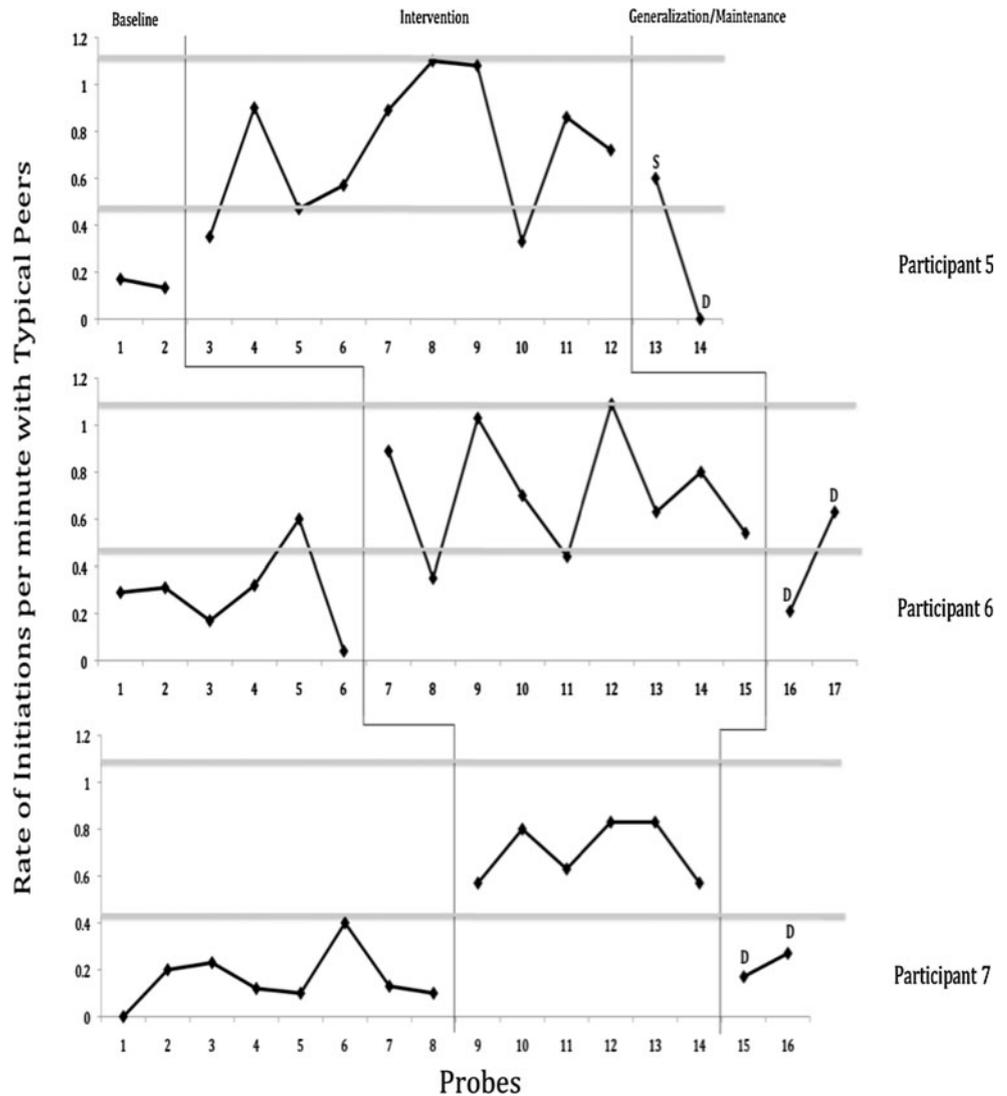
**Fig. 3** Target adolescents’ (from cohort 1) rate of initiations per minute with typically developing peers. S indicates participant participated in a similar structured club activity that was already available at the school during lunchtime and the D indicates

participant participated in a different activity during lunchtime. The gray horizontal lines represent range in initiations for typical adolescents

between 0 and 36 % of the intervals. Once intervention was implemented, his level of engagement improved, almost always within the typical range (35–95 %). Specifically, he was engaged with typical peers between 22 and 68 % of the intervals. During generalization measures, Participant 6’s level of engagement dropped back down to baseline levels of 0–33 %. The first generalization probe indicates that Participant 6 returned to baseline condition. Although the second generalization was higher than the first probe, he was still within the baseline condition. The “D” in the figure represents that these generalization activities were highly dissimilar to the intervention club activities.

Participant 7 showed limited to no engagement with typical peers during baseline. Specifically, during baseline she was engaged with typical peers between 0 and 13 % of the intervals. During intervention, Participant 7’s level of engagement with typically developing peers gradually reached the typical range (35–78 %), reaching between 20 and 63 % of the intervals. During generalization measures, Participant 7’s level of engagement also dropped back down to baseline levels of 0–7 %. Once again, the “D” in the figure represents the fact that these generalization activities were highly dissimilar to the intervention club activities.

**Fig. 4** Target adolescents' (from cohort 2) rate of initiations per minute with typically developing peers. S indicates participant participated in a similar structured club activity that was already available at the school during lunchtime and the D indicates participant participated in a different activity during lunchtime. The gray horizontal lines represent range in initiations for typical adolescents



Rate of Initiations

Cohort 1

Participant 1 made between 0 and 0.03 initiations per minute during the baseline sessions, which was far below the range for his typical peers. During intervention, however, Participant 1 made between 0.49 and 1.15 initiations per minute, which was well within range of the typical students (0.46–1.38). During generalization measures, Participant 1 made no initiations to his typical peers. The “D” in the figure represents the fact that these generalization activities were highly dissimilar to the intervention club activities.

Participant 2 made some initiations during baseline, but was not within the range of his typical peers. He made between 0.03 and 0.3 initiations per minute in the baseline condition. Once intervention was implemented, Participant

2 made a gradual increase in his rate of initiations per minute to his typical peers, eventually reaching the range of his typical peers (0.88–1.4). Specifically, during intervention he made between 0.57 and 1.02 initiations per minute. During generalization measures, Participant 2 made some initiations to his typical peers, therefore improving from baseline condition, but was still below the range of the typical peers. Specifically, he made between 0.72 and 0.83 initiations per minute. Once again, the “D” in the figure represents the fact that these generalization activities were highly dissimilar to the intervention club activities.

Participant 3 also made some initiations during baseline, but he was also below the range of his typical peers. Specifically, he made between 0.06 and 0.37 initiations per minute in the baseline condition. During the intervention phase he made between 0.76 and 2.33 initiators per minute, reaching the typical range (0.8–2.4). During maintenance

measures, Participant 3 maintained his rate of initiations with his typical peers, making between 1.2 and 1.36 initiations per minute, continuing to fall within the typical range. The “S” in the figure represents the fact that these generalization activities were highly similar to the intervention club activities.

Participant 4 made little to no initiations to his typical peers during baseline. He made between 0 and 0.19 initiations per minute in the baseline condition. Although Participant 4 did not reach the typical range of rate of initiations per minute during intervention (0.8–2.4), he improved from the baseline condition. Specifically, he made between 0.1 and 0.52 initiations per minute during intervention. During generalization measures, Participant 4 made some initiations to typical peers during the first probe with a decrease in the number of initiations he made by the second probe. Specifically, he made between 0.31 and 0.13 initiations per minute. The “D” in the figure represents the fact that these generalization activities were highly dissimilar to the intervention club activities.

### Cohort 2

Participant 5 made between 0.13 and 0.17 initiations per minute during the baseline sessions, not reaching the range of his typical peers. During intervention, however, Participant 5 made between 0.33 and 1.1 initiations per minute, which was well within range of the typical students (0.43–1.15). During the first probe after the intervention ended, Participant 5 continued to play basketball with his peers (preferred, but non-club activity). During that probe (characterized by an “S” for similar activity), his rate of initiations was relatively high (0.6). In the second probe after the intervention ended, Participant 5 participated in a variety of non-basketball activities. During that probe (characterized by a “D” for dissimilar activity) he made zero initiations to his peers.

Participant 6 made between 0.04 and 0.31 initiations per minute during baseline, which was not within the range of typical rate of his typical peers. During intervention, Participant 6 made between 0.35 and 1.09 initiations per minute to typical peers, reaching the typical range (0.44–1.10). During generalization measures, Participant 6 made between 0.21 and 0.63 initiations per minute to typical peers. The first generalization probe indicates that Participant 6 returned to near baseline condition, while the second generalization probe indicates that he was in the typical range, despite the fact that these generalization activities were highly dissimilar to the intervention club activities (represented by the “D” in the figure).

Participant 7 made limited initiations during baseline. Specifically, she made between 0 and 0.4 initiations per

minute, which was below the range of her typical peers. During the intervention phase, she improved, reaching the range of her typical peers (0.41–1.10). Specifically, she made between 0.57 and 0.83 initiations per minute during intervention. During generalization measures, Participant 7 made between 0.17 and 0.27 initiations per minute to typical peers, which is below the rate of her typical peers. Once again, the “D” in the figure represents the fact that these generalization activities were highly dissimilar to the intervention club activities.

### Social Validation Measures

The results from the social validation questionnaire administered following the intervention showed the results described below. Tables 1 and 2 show modal responses from typical peers and responses from the target adolescents. For example, when the students were asked why they joined the club, most replied that they joined to have fun or because they enjoyed the activity. This was similar for both the target students and their typical peers. When asked if they made new friends, about half of the target students and almost all of the typical students reported that they made at least one new friend and could name the friends they had made through the club. It is also noteworthy that for two of the clubs, the child with autism was named as one of the “new friends” by at least one typically developing peer. Further, almost all the adolescents that participated in the clubs reported that the clubs were enjoyable and most commented that the clubs made them feel “happy”. Finally, when asked how the club could be improved, many students suggested more frequent club meetings.

### Discussion

The results of the study suggest that high school students with ASD can appropriately socialize with typical peers if activities are created around their preferred interests. Specifically, adolescents with ASD in this study demonstrated increases in their engagement with and initiations to their typical peers with no differences observed in the effectiveness of the club being implemented in the fall semester and spring semester. Further, both the target students and their typical peers reported that the structured activities were enjoyable.

This study adds to the limited research on effective social intervention models for adolescents with ASD in inclusive high schools. Most of the existing intervention studies have focused on preschool and elementary aged children with ASD (Mesibov 1984; Humphey and Symes 2011). This has been a growing concern because adolescents with ASD are often bullied and teased (Roekel et al.

2010), report greater feelings of loneliness (Locke et al. 2010; Bauminger and Kasari 2000), and are more likely to develop secondary co-morbid disorders such as depression (Ghaziuddin et al. 2002) and anxiety (Bellini 2004). Similar to previous research with younger children (Baker et al. 1998), our study demonstrates that high school students with ASD can appropriately socialize with typical peers if their preferred interests are a core theme of lunchtime activities. In regard to mental health, the participants (as well as their typical peers) reported feelings of happiness and enjoyment while engaging in the club. Moreover, most of the participants were observed to make appropriate initiations and appropriately engage with typical peers. This may be due to the fact that the intervention allowed them to appropriately discuss conversation topics that revolved around their preferred interests with typical peers that had similar interests (Charlop et al. 1990; Wolery et al. 1985).

It is interesting to note that the high levels of social engagement and initiation primarily occurred when the activities incorporated the student with ASD's preferred interests. In the one case where outside of school social activities were reported (attended movies with peers), they still revolved around the adolescent's preferred interests. This may suggest that a high level of motivation may be necessary for these adolescents to socialize with their peers, at least in the initial stages. Further research on trajectories over time, as social skills develops, may be very interesting to investigate.

Although the results of this study generally suggests improved social behavior for adolescents with ASD in the high school setting as a result of the intervention, a limitation of this study was the lack of collecting both generalization and maintenance data for all the participants. For example, we collected either generalization or maintenance data dependent on whether the school continued or discontinued the club activities. Another limitation of the study was the lack of generalization across different types of activities other than the type used in this study. Future studies should investigate how to help these adolescents generalize the social skills across settings and other types of activities. It may also be interesting to assess the affects of a lengthier intervention (i.e., a whole school year versus a few weeks) on both generalization and maintenance.

In summary, this study systematically investigated an intervention model for adolescents with ASD in their inclusive school setting in order to improve their socialization with typical peers. The approach was simple and did not deviate extensively from the extracurricular activities that schools already offered to students. The primary difference between the extracurricular activities schools provided and this study's intervention was the incorporation of the adolescent with ASD's preferred interests into these activities. This manipulation has been shown to greatly

enhance the socialization of younger children with ASD with typical peers (Baker et al. 1998) and was similarly effective with high school students. Future studies investigating procedures to train existing school staff to implement this simple, but effective, social intervention model for individuals with ASD are warranted.

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