

*The Impact of Social Communication on Employment Success for Adolescents with Autism Spectrum Disorders*

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*Abstract*

This study evaluated the effectiveness of a social communication intervention for improving the social skills and employability of four adolescents with Autism Spectrum Disorders (ASD). A multiple baseline across participants design was used to investigate the effectiveness of social communication skill development on equitable exchange in social conversations in a school training setting and an employment setting. Components from the *Social Thinking* curriculum that taught social communication through development of verbal interactions using supportive comments, follow-up questions, and bridging comments were combined with peer modeling and self-evaluation to provide the components of the intervention. The findings indicated that growth occurred for three of the four participants in their use of the aforementioned social communication skills in the school training setting; further growth generalized for two of the four participants to the employment setting.

*Keywords:* Autism Spectrum Disorders, Employment, Social Communication Skills

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Dynamic, unpredictable social situations present considerable challenges for adolescents and young adults with Autism Spectrum Disorders (ASD). Individuals with ASD share similar social and communication characteristics ranging from mild to severe that negatively impact an individual's ability to engage in natural social discourse (Carter, Davis, Klin, & Volkmar, 2005; Colle, Baron-Cohen, Wheelwright, & Van Der Ley, 2008; Ledford, King, Harbin, & Zimmerman, 2018). Individuals with ASD tend to have greater difficulties sustaining conversations and adjusting to the social context of an interaction than their same-age peers (CDC, 2013). Additionally, individuals with ASD may present a self-indulgent focus on restrictive, repetitive interests as well as challenges with perspective taking and empathy towards others (Bennett et al, 2008; Rao, Beidel, & Murray, 2008; Seltzer, et al., 2003). These difficulties tend to become more prominent in adolescence as social interactions increase in complexity and require quicker, mutual exchanges to achieve communication success (DeRosier, Swick, Davis, McMillen, & Matthews, 2011; Pugliese et al., 2015; White, Koenig, & Scahill, 2007).

For youth with ASD, the array of unpredictable social situations extends into adult environments with new challenges of increased unstructured social experiences in settings such as employment (Barnhill, 2007; Hendricks, 2010; Howlin, Alcock, & Burkin 2005; Wehman, et. al. 2012). The stress associated with transition-related changes, coupled with socialization difficulties, often lead to multiple, short-term and unsuccessful employment experiences (Barnhill, 2007; Jennes-Coussens, Magill-Evans, & Konig, 2006; Muller, Schuler, Burton, & Yates, 2003). In fact, Shattuck and colleagues (2012) stated that in comparison to young adults with other disability categories, youth with ASD had the poorest employment participation rates post-high school. The employment rates for people with ASD in the NLTS 2 data have been reported to be as low as 31% (Newman, Wagner, et al., 2011). These poor outcomes for adults with ASD often also result in significantly lower wages and hours per week than their peers (Cimera & Cowan, 2009). Ganz (2007) reported that the consolidated lifetime cost of unemployment among adults with ASD was more than \$970,000. Thereby leading to a negative impact on society as well as the individual due to lost employment wages and increased consumption of governmental services and benefits (Howlin, Alcock, & Burkin, 2005).

Although the poor employment outcomes indicate the need for workplace interventions for individuals with ASD, limited employment research has been conducted. A recent longitudinal study emerged indicating the successful efforts of Project SEARCH at improving the employment outcomes for young adults with ASD (Wehman et al, 2012). Project SEARCH provided community-based instruction in an employment site focused on developing social communication skills. Throughout the internship, the participants' challenging behavioral incidents decreased and their abilities to perform the job tasks with accuracy increased. Additionally, a study from the United Kingdom focused on providing a supported employment program for adult employees with ASD. The study developed (a) socialization between the employee and coworkers, (b) appropriate communication with supervisors and coworkers, and (c) ongoing problem solving skills through employment coaching in over 70% of the participants with ASD (Howlin, Alcock, & Burkin, 2005). The participants also reported high levels of job satisfaction and moderate salary increases.

As previously discussed, the development of social skills can significantly impact the employment experiences of students with ASD. Social skill interventions have been utilized with this population to assist them in improving their long-term outcomes. The Program for the Education and Enrichment of Relational Skills (PEERS) has been studied as an intervention focused on developing and maintaining friendships for adolescents with ASD with promising results (Mandelberg et. al, 2014). Further interventions have focused on improving social cognition processes with the goal of decreasing social withdrawal of youth with ASD (Stichter, et al. 2010), and others have studied 3D immersive environment systems to help young people with ASD learn and understand social skills (Boccanfuso et al., 2015; Cheng, Huang, & Yang, 2015). Interestingly, many social skill interventions for people with ASD and other disabilities such as anxiety and schizophrenia focus on utilizing cognitive-behavioral therapy to improve specific social skill deficits (Boettcher, Hasselrot, Sund, Andersson, & Carlbring, 2014; Granholm, Holden, & Link, 2014; Othman, Ramlee, Ghazalan, Wei, & Shahidi, 2015; White, et. al., 2010.) The focus for the current study was to investigate using social communication skill development as a means to improve acceptable social interactions in employment settings for

youth with ASD. *Social Thinking* (Winner, 2007), was chosen as a promising resource to use in this study because it combines the evidence in the field from cognitive-behavioral therapy interventions and teaching social communication skills into a useful and viable curriculum.

*Social Thinking* teaches social communication skills through perspective taking, reciprocal conversation skill development, and problem solving. *Social Thinking* is widely used by autism practitioners across various age groups. Within the past 10 years, early evidence has emerged validating the effectiveness of this program (Winner & Crooke, 2014). Specifically, Lee and colleagues (2015) found that students displayed significant increases in skills when *Social Thinking* was used as an intervention; and Crooke, Hendrix, and Rachman (2008) found that social communication strategies from the *Social Thinking* curriculum significantly improved the use of expected social behaviors of children and adolescents with ASD in informal and casual conversations.

The purpose of this study was to gather data on the effectiveness of using social communication strategies derived from *Social Thinking* to improve the conversations of young adults with ASD in both the school, training setting and the employment setting. The following research questions were addressed:

- (1) Will intervention components derived from the *Social Thinking* curriculum increase the social communication skills for participants with ASD in a school setting?
- (2) Will the supportive comments skill generalize to an employment setting?

### ***Method***

This study utilized a multiple baseline design across participants to determine the effectiveness of the intervention on equitable exchanges in conversations at the school and employment settings. The design employed an uninterrupted baseline phase and intervention phase for the school, training setting, which established evidence of progress toward social communication skill increases. Concurrent to the school, training data collection, generalization probes were conducted in each participant's employment setting. The analysis of the target behaviors was conducted using systematic observations based on clearly defined behaviors described in the measurement section. Each participant was observed in conversations separate from the other participants in both the school and employment settings to establish experimental control of the intervention. Additionally, Tau-U effect size analyses were conducted to provide further evidence of the impact of the intervention.

### **Participants**

Four high school students with ASD, three males and one female, participated in this study. These particular participants were chosen because they were participating in part-time volunteer employment experiences as part of their high school curriculum. At the time of this study, students with ASD, specifically high functioning aspects of ASD, in this community were often participating in college-preparatory curriculum and some students such as these participants were also participating in career exploration activities. At the time of this study, two students were 20 years old, one was 19, and one was 18. The presence of ASD was identified through verification

from the Individualized Education Program (IEP) with a diagnosis of ASD. Table 1 summarizes the demographic data. The students' names are aliases to keep their identities anonymous.

Table 1  
*Sampling Results.*

Descriptives	Brett	Misty	Steven	Alan
Age	19	20	20	18
IEP Disability Diagnosis	HFA	AS	PDD-NOS	AS
Volunteer Job Sites	Custodian Dishwasher	Mail Delivery	Custodian	Teacher's Aide

Note: At the time of this Study, the following diagnoses were still used in the field: HFA = High Functioning Autism, AS = Asperger Syndrome, PDD-NOS = Pervasive Developmental Disorder – Not Otherwise Specified. Study was conducted prior to the combination of these categories under one spectrum – ASD.

**Peer Models.** Peer models without disabilities were recruited to act as conversation partners in the school setting. Three peer models were recruited: two, 17 year old females from the high school and one, 20 year old female from a local university. Coworkers in the employment setting were the conversation partners for the generalization settings.

**Peer model training.** During a one-hour session prior to baseline, the three peer models learned about the study, the core components of the three social communication skills, and their roles as a conversation partner. The peers did not have access to any private diagnostic information or assessment results regarding the participants with ASD. However, they were informed of the general characteristics of individuals with ASD. Video clips of modeled conversations using the conversational components (i.e. supporting comments, follow-up questions, and bridging comments and questions) were shown. In addition, the peers were trained to respond appropriately when the participant used any of the three skills and demonstrated expected non-verbal cues such as eye gaze shifts and gestures towards or away from the partner.

### Setting

**School.** A counseling office at a Midwestern, suburban high school was used as the training setting and for the baseline and intervention data collection for Alan and Steven; an empty classroom was available for Misty and Brett's data collection and intervention training. The intervention consisted of training on each of the three skills twice a week for 20 minutes. Conversations with peer models for data collection occurred once or twice a week for about 8 minutes. Peer models accompanied the researchers during the training with each participant and then engaged in conversations with the participants immediately after the training. Generalization probes were collected once a week in each participant's employment setting in baseline and intervention phases with data collected in intervention within one day.

**Employment Setting.** The cooperating school placed each participant on a community volunteer job site that aligned with their interests. Each job site focused on developing employability skills. Each participant had some job coaching support ranging from side-by-side coaching to consultative coaching. Steven volunteered at a community thrift store; Misty volunteered at a

local nursing home; Alan volunteered as a teaching assistant in a special education classroom; and Brett volunteered at two jobs during the study, one at a community pool and the other at a local restaurant. The jobsite times were one hour in length, and the participants had a significant number of tasks to complete in the short time they worked. Therefore, supportive comments were presented most often and became the focus of the generalization data probes.

## **Measurement**

**Dependent Variables.** This study focused on observing social conversation skills. Data were collected using a partial interval recording method for: (a) making supportive comments, (b) asking follow-up questions, and (c) using bridging responses. These three skills build upon each other with supportive comments being a foundational skill that is used across various settings and is the most simplistic of the three skills. Asking follow-up questions builds on the supportive comments by asking a more in-depth question related to a supportive comment topic. Making bridging responses in a conversation is the most challenging of the three skills and requires the speaker to bridge from one conversation topic to another related topic which may change the subject. In a casual conversation with a peer, supportive comments will occur most often; follow-up questions will happen some of the time, and making bridges will be the least frequent (Winner, 2008). All three skills increase the mutual verbal exchange in a conversation by developing the participant's ability to actively listen and demonstrate interest in the partner's topic while still having the option to discuss his or her own topic of interest at a reasonable rate (Winner, 2008). Thus, the use of one or more of these skills indicated successful exchange in the social conversation. The following information operationally defines each skill.

***Skill 1: Making supportive comments.*** This skill required that the participant maintain a shared point of reference with the partner, listen to the partner's topics of interest, and develop short, positive responses related to the partner's topics. Supportive comments could be verbal responses such as "Oh Yeah," or "Right!" or nonverbal responses such as head nodding.

***Skill 2: Asking follow-up questions.*** This required that the participant ask follow-up questions to probe for more information about a partner-initiated topic of interest. Follow-up questions gathered in-depth responses to a topic (e.g. "So you went to the Arch in St. Louis." "What was it like?" "Did you get scared at any point?").

***Skill 3: Using bridging responses.*** This required the student to introduce a new but related topic to the conversation (e.g. "You went to the Arch. Cool. I've been to the Washington Monument"). Bridging responses are designed to move the conversation toward a related topic of interest while keeping within the general conversational topic (Winner, 2007).

**Observation checklist.** Prior to this formal study, an informal pilot study was conducted to establish which components of the curriculum were essential to be taught in the formal study; the observation checklist resulted from this informal, pilot study. For the formal study, this observation checklist measured the frequency of intervals of the social conversational skills. Partial interval recording measured the occurrence or non-occurrence of any of the three skills in ten-second intervals during the length of the conversation. The school settings were naturally conducive to longer conversations as they were in casual, comfortable environments with few time constraints. In the school setting, if the participants demonstrated any of the three social

conversation skills, the researchers recorded a 1 for the interval; if none were used the researchers recorded a 0. *The checklist can be viewed by contacting the author.*

The conversations on the job site were shorter due to the one-hour work time constraints and the large number of tasks to complete. Subsequently, the participants were rated on their use of the supportive comments skills. If supportive comments were present, the researchers counted the interval as a 1; if they were not present, the researchers recorded a 0. For each setting, the researchers calculated a frequency of intervals for data recording purposes.

### **Design**

A multiple baseline across participants was chosen to determine if there was a functional relation between the intervention and the participants' social communication skills. All three skills were assessed for each participant as one comprehensive social conversational skill labeled *social communication skills*. The researchers assessed social communication skills twice per week without interruption in the school setting, while the supportive comments probes in the generalized employment settings occurred either on the same day or within 1 day of the assessment in the school setting.

As a result of random assignment, baseline data collection started with Steven, then proceeded to Brett, Misty, and Alan. The introduction of the intervention was also staggered across the participants based on the consistency of trends within their baseline frequencies. As a result of the baseline data collection trends, Steven was the first to receive the intervention as he demonstrated 3 of 4 baseline frequencies in the same range. Brett followed Steven with 3 of 5 consistent baseline frequencies in the same range showing a trend. Misty received the intervention next after her upward trend in frequencies leveled out. Alan was the last to receive the intervention after data demonstrated 4 consistent baseline frequencies.

**Effect Size Calculation.** Visual inspection of the graphed data occurred throughout and at the conclusion of the study to identify the impact of the intervention on the social communication skills of the participants. Tau-U effect size calculations were also conducted to provide experimental control for positive baseline trends existing in two of the four participants' data. Using an effect size analysis in single case designs provides the opportunity to evaluate positive baseline trends to determine their significant impact on the intervention trends. Parker and colleagues (2011) recommended Tau-U for trend control because it does not irrationally inflate the ceiling of the effect size and instead keeps the y-scale within reasonable limits.

In the present study, Tau-U controlled for the positive baseline trends in two of the four participants by using the online calculator found at <http://singlecaseresearch.org> which calculates non-overlapping data between baseline and intervention phases, reversing the sign of the data series and then re-computing the full trend. These three steps impose a rational ceiling on control. To provide consistent application of experimental methods, the researchers applied the Tau-U calculation to all four participants resulting in means, standard deviations, p-values, and effect sizes for all eight data sets (school and employment settings for all four participants).

## **Procedure**

The researchers conducted the study over the course of 10 -14 weeks which varied due to the staggered baselines. The intervention training was introduced and instructed for each participant over five to six weeks and consisted of four components: (a) skill-specific training, (b) social behavior mapping; (c) self-evaluation; and (d) peer modeling. The skill-specific training activities and social behavior mapping were derived from *Social Thinking* (Winner, 2007). Training addressed one of the three conversational skills (e.g. supportive comments) and occurred approximately twice a week using discussions, role playing, and demonstration techniques. These activities taught the participant to anchor his or her thoughts on the conversation partner to increase social conversational skills. As well, each participant constructed a social behavior map of the recent peer model conversation to problem solve solutions. The social behavior map visually organized expected and unexpected behaviors and consequences for a social interaction and provided an opportunity to problem solve similar settings and contexts in future conversations. Figure 1 displays a sample Social Behavior Map.

Figure 1.  
*Social Behavior Map Example.*

**Setting: Cafeteria.** There is not necessarily a 1-1 correlation between the behavior listed and the feelings or consequences experienced. Any or all of the behaviors listed could produce any or all of the feelings or consequences listed.

<b>Expected Behavior</b>	<b>Feelings of other people</b>	<b>Consequences</b>	<b>How you feel about the consequences</b>
1. Sit with peers 2. Eat your own food 3. Use manners 4. Have small talk 5. Clean up your trash	Comfortable Friendly Safe Happy Interested in the conversation	Peers may want to talk to you again You and this group may sit together again You enjoy your food They enjoy their food You may talk to your peers later in another class	Happy Safe Excited to have peers to sit with Interested in sitting with them again
<b>Unexpected Behavior</b>	<b>Feelings of other people</b>	<b>Consequences</b>	<b>How you feel about the consequences</b>
1. Not talking to peers sitting with you 2. Sitting alone 3. Eating other people's food 4. Arguing with peers 5. Leaving trash on table	Sad Angry Frustrated Disgusted Worried about why you are sitting alone Confused about why you won't talk to them	Your peers: May not sit with you again May not talk to you later in the day in another class May get up and walk away May say hurtful things to you when you argue May tell an administrator about your behavior	Frustrated Angry Sad Lonely Upset



In combination with the social behavior mapping activity, the participants evaluated video clips of their conversations with the peer models to identify strengths and areas for further development. The researchers posed questions to encourage self-evaluation: (a) what did you think of this conversation; (b) what went well and why; and (c) what was difficult and why? The participants identified action steps to use for the next conversation.

**Intervention Fidelity.** A checklist of the activities associated with each lesson was used to assess fidelity and determine if the intervention was delivered as intended by the curriculum resource, by the guidelines of the study, and to each of the participants in a comparable manner. The researchers viewed the checklist before each lesson and completed it after each lesson as a fidelity self-check. Additionally, a graduate student blind to the study was asked to observe three sessions with three different participants to determine whether implementation occurred in the same manner for each participant. The graduate student's results indicated similarity across what intervention the participants received and fidelity to the goals and objectives of each lesson. Treatment fidelity across all three sessions was 95%.

**Inter-observer agreement.** The peer conversations in school were video recorded for inter-observer agreement. Two researchers simultaneously recorded data across peer conversations representing 20% of Brett's conversations; 15% of Misty's conversations; and 13% of Alan and Steven's conversations. These last two percentages were low as a result of faulty recordings that were difficult to measure and the inability for the second researchers to attend the live conversation. The percentage of overlapping observer data was determined by dividing the number of agreed upon intervals by the total number of intervals possible. Inter-observer agreement between the two recorders was 96%.

Inter-observer agreement for the employment conversations was conducted in a similar manner. Five employment conversations (1 for Misty, 3 for Brett, and 1 for Steven) were video recorded for inter-observer agreement. Misty and Steven's employers allowed the researchers to record one session given the disruption that would occur if two researchers were observing during the job setting. Brett's second employer allowed the researchers to record 3 sessions but his first employer refused since it was a public, community pool setting. Inter-observer agreement data were not collected for Alan's employment setting as he worked in an educational setting, and the employer was concerned that consent would be needed for video recording of students in the classroom. Inter-observer agreement on the employment conversations was 97%.

### **Social Validity**

**Typically developing threshold.** To determine a consistent threshold for the use of social communication skills in natural conversations among typically developing adolescents and adults, one triad conversation and six dyad conversations were recorded from a convenience sample of typically developing individuals (i.e. 3 female teens, 2 female young adults, and 2 male adults). This established a natural, social conversational mean for comparison to the participants' skill usage. The researchers utilized the same interval sample data collection and analysis procedures to determine an overall percentage score. Results for use of any of the three social communication skills during a natural conversation for a typically developing adolescent or adult was an average of 53. This established the criterion for the typically developing

threshold, and was represented on the data graphs as a dotted black line. *Sample excerpts from the conversations can be received by contacting the author.*

### **Results**

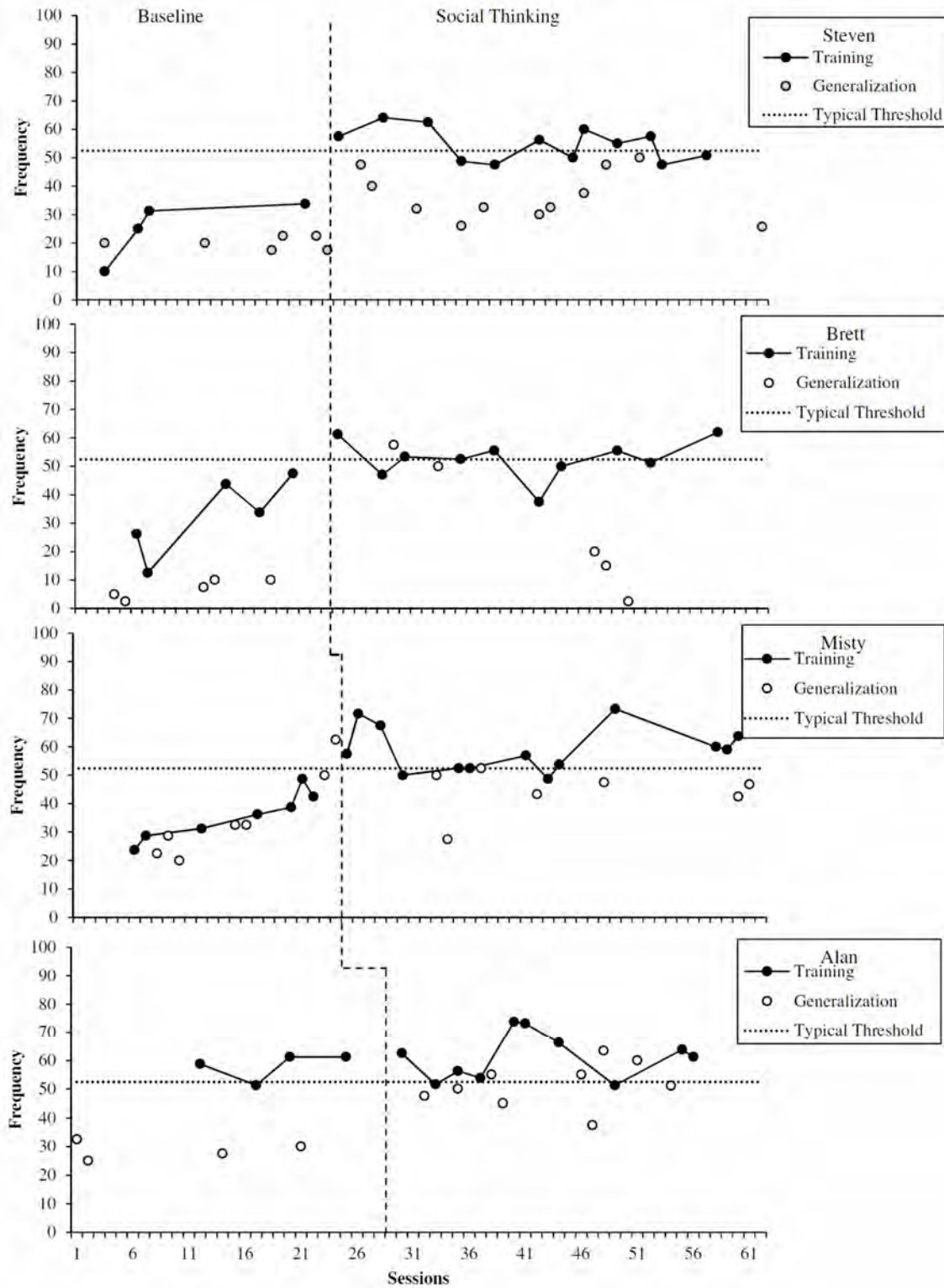
The graphed results displayed in Figure 2 indicate that *Social Thinking* combined with peer modeling and self-evaluation was effective in the school setting at increasing social communication skills for three of the four participants. In the generalized employment setting, the graphed results of the probe data indicate that two of the four participants increased their use of supportive comments in conversations with coworkers. One participant (Alan) didn't display significant increases in the school setting but demonstrated significant growth in the generalization setting. Table 2 displays the effect size calculations for the graphed results as well. Graphed and effect size results are explained in the following sections outlined for each participant.

Table 2  
*Effect Size Tau-U Results*

Participants	School Setting				Employment Setting			
	BM(SD)	IM(SD)	Effect Size	Value	BM(SD)	IM(SD)	Effect Size	Value
Steven	25(10.7)	54.8(5.8)	1.00	0.004*	20(2.0)	33.9(10.1)	0.84	0.012*
Brett	32.8(14.1)	52.6(7.1)	0.88	0.007*	7.0(3.3)	29.0(23.6)	0.65	0.090
Misty	35.7(8.5)	59(8.0)	0.98	0.001*	35.5(15.3)	44.3(8.2)	0.36	0.250
Alan	58.1(4.7)	61.4(8.2)	0.32	0.358	28.8(3.2)	51.6(7.9)	1.00	0.006*

*\*=indicates statistical significance at the .05 level or better. BM = Baseline Mean, IM = Intervention Mean*

Figure 2.  
Graphed Results.



**Steven.** Steven's results indicated growth from baseline to intervention in the graphed results for both the school setting and the employment setting. Specifically, his school setting data resulted in a baseline mean of 25 (SD 10.7) and a significant increase in intervention of 54.8 (SD 5.8) corresponding to a highly significant 1.0 effect size. Additionally, his generalized employment data were significant with a mean of 20 (SD 2) in baseline and 33.9 (SD 10.1) in intervention resulting in a moderately significant 0.84 effect size. Steven also showed growth regarding the typically developing threshold in intervention as all of his data points centered around the threshold in the school setting and half of his data probes in the generalized setting.

**Brett.** Brett's graphed data demonstrated significant results in the school training setting as well with a baseline mean of 32.8 (SD 14.1), and an intervention mean of 52.6 (SD 7.1) which produced an 0.88 effect size. Brett's graphed results indicated an ascending baseline which was accounted for with the TAU-U effect size. Brett's generalization results showed initial growth at his first job site with a stark increase to 60 in comparison to his baseline mean of 7 (SD 3.3). However, at the start of his new job, he dropped back to baseline frequencies resulting in an intervention mean of 29.0 (SD 23.6) and effect size of .65, which is approaching significance but not statistically significant. Additionally, Brett demonstrated growth in the school setting regarding the typically developing threshold as all of his data points centered around the threshold in intervention. He had inconsistent growth in the employment setting due to his job setting change.

**Misty.** Misty's graphed results in the school setting showed significant growth from baseline to intervention with a baseline mean of 35.7 (SD 8.5) and an intervention mean of 59 (SD 8) corresponding to a highly significant .98 effect size. Her generalization mean remained similar in intervention at 44.3 (SD 8.2) as compared to baseline 35.5 (SD 15.3) with a .36 effect size resulting in non-significant results. Her school setting resulted in growth regarding the typically developing threshold and all of her data points centered around or were above the threshold in intervention. Her employment setting did not show change towards the threshold.

**Alan.** Alan's graphed results in the school setting remained similar in intervention 61.4 (4.7) as compared to baseline 58.1 (SD 8.2) resulting in a .32 effect size and non-significant results in that setting. However, his generalization setting results indicated significant growth from baseline to intervention with a baseline mean of 28.8 (SD 3.2) and a significant intervention mean of 51.6 (SD 7.9) which produced a highly significant effect size of 1.0. Additionally, his school setting results maintained very close data points to the typically developing threshold and his employment setting results showed growth regarding the threshold with all but one of his data probes centered around the threshold line.

### ***Discussion***

Using social communication, peer modeling, or self-evaluation techniques to train adolescents with ASD on social conversational skills have emerged with some initial research in the past 10 years, yet intervention studies are still sparse. Specifically intervention studies that combine all three techniques are very limited. Similarly, evidence regarding the generalization of social communication skills to employment settings for adolescents with ASD continues to be an emerging field of research. This particular study provided preliminary data to narrow these

research gaps and suggested the effectiveness of the innovative intervention of *Social Thinking*. The information gleaned from this preliminary study can inform enhancements to future use of this curriculum.

Previous results of social communication studies have focused primarily on young children in school settings. Othman and colleagues (2015), Reaven and Hepburn (2003), and Sofronoff, Attwood, Hinton, and Levin (2007) used cognitive behavioral therapy with young children to improve their social skills with peers. Solomon, Goodlin-Jones, and Anders (2004) used social communication skill training to address social skill deficits specifically in children with ASD. Mandelberg and colleagues (2014) expanded the field to address social skill development with adolescents with ASD. This social communication study provided results for adolescents and young adults with ASD in employment settings, within which few studies had been conducted. The study also adds to the preliminary evidence being collected on the efficacy of the *Social Thinking* curriculum (Crooke, Hendrix, & Rachman, 2008; Garris, 2007; Lee, et al., 2015). Social communication was defined in this study as using one or more of the three skills: supportive comments, follow-up questions, and bridging responses during conversations with peers. Overall, three of the four participants showed promising skill growth in using social communication skills during intervention in the school setting with Steven showing significant skill growth upon visual inspection and Misty showing significant growth with effect size analysis. The combination of problem solving, inherent in the social behavior mapping and self-evaluation, and the skill-specific training provided by the researchers and through peer modeling allowed the participants multiple opportunities to observe the skills in natural conversations and then adopt the skills for their own use in future conversations. Having regular instruction in the use of these skills resulted in positive effects in the casual school setting conversations with peers. All three social communication skills taught in this study are natural components of a casual conversation with peers. Teaching these skills and providing natural opportunities to use them with peers increased the participant's development of the skills.

Generalization of the intervention to the employment setting yielded promising results for the use of supportive comments with two of the four participants. A lack of quick responsiveness in conversations has been a recurring theme for why adults with ASD are not sustaining employment (Hurlbutt & Chalmers, 2004; Jennes-Coussens, Magill-Evans, & Konig, 2006; Stitcher et al., 2010; Volkmar et al., 2014). Not surprisingly, prior to the intervention, three of the participants were not actively using supportive comments in their employment setting as is evident by low or inconsistent baseline data probes for Brett, Steven, and Alan. Notably, for two of these three participants, Alan and Steven, supportive comments increased significantly in the generalized setting. Brett's job site data can be considered an outlier since he changed jobs during the study. His initial intervention probes suggested the use of supportive comments was on the rise, but his change of jobs interfered with making a functional determination of the data's impact. Misty's data indicated that further targeted intervention may have been needed for her generalization to occur. Overall growth for two of the four participants provides preliminary evidence of the generalizability of the intervention to an employment setting.

This intervention provides notable impact on the equitable exchange that occurred between the participants and their same-age peers. Within the school setting, adolescents with ASD often struggle to maintain conversations and have equitable exchanges of information that foster

further conversations in the future (Pugliese et al 2015). This study's results indicated that the *Social Thinking* strategies, combined with peer modeling and self-evaluation, assisted three of the four participants to maintain reciprocal conversations with their same-aged peers. Specifically, Steven's data indicated the most significant growth from baseline to intervention in the school setting with an effect size of 1.0, with Misty's growth effect size of .98 being very close behind. Furthermore, having two of the participants generalize the skills with significant improvements in the employment setting demonstrated additional positive growth as a result of the intervention. While Alan was an outlier in the school setting by demonstrating skill acquisition in baseline and little to no change in his use of the skills in that setting, he showed substantial growth in the employment setting with use of supportive comments resulting in the largest effect size of 1.0. Having access to a problem solving and social communication strategy that he could apply to an employment setting where he was having difficulty engaging in equitable conversations proved valuable for him to improve this skill.

Future research may need to allow more time for direct development of the supportive comments skill in employment settings to acquire greater generalizable results. Most job settings for adolescents with disabilities, such as the ones in which the participants were employed, are introductory jobs focused on skill training for one hour of the day. While there are opportunities to use supportive comments in short conversations, the opportunities may be limited due to the short time period the students attend the job and the lack of conversation partners. The preliminary results from this study may indicate that supportive comments development in adolescent job settings may improve the sustainability of employment for youth with ASD.

**Limitations.** Some limitations materialized during data analysis, possibly as a result of the preliminary nature of the study. The sample size in this study is small given the nature of the single case design methodology. Small sample sizes can cause limitations on the generalizability of the data.

The use of Tau-U was employed to address positive baseline trends, specifically in Brett's data and Misty's data. While Tau-U adequately accounts for the effects on experimental control that an ascending baseline can cause, it is still important to identify the limitations inherent within an ascending baseline. Allowing for a longer baseline for Misty and Brett may have leveled out the data trend. However, Parker and colleagues (2010) ascertained through thorough analysis of over 30 single subject design studies with positive baseline trends that this trend in visual representation does not necessarily correlate with a reduced functional relationship between the intervention and the participant's skill development if combined with the use of a sensitive effect size calculation to control for the positive trends. Tau-U provided the sensitivity to account for the trends in this study.

Furthermore, Misty's generalization results may have been improved if the intervention was provided in the employment setting in addition to the school setting. Training the participants in one setting but not reviewing the skills in the generalized setting can cause some limitations due to the lag between when the intervention was trained and when the generalization setting was observed. Having the opportunity to review the skills prior to entering the employment setting may have beneficial implications for future iterations of this intervention. Additionally, in the employment setting there were limitations on the use of only one social conversational skill:

supportive comments. Since the settings were short and very task oriented, the conversations with coworkers were limited in length and depth.

Finally, non-verbal communication skills were not directly examined in this study. However, literature in the field of autism has recognized the need for individuals with ASD to improve their awareness of and use of non-verbal communication skills (Myles, 2005; Simpson, Myles, & LaCava, 2008). The field would benefit from an examination of the impact of this intervention on non-verbal receptive and expressive communication.

**Conclusion.** The preliminary results of this study support the promise of this intervention to improve social communication skills among adolescents with ASD. The results warrant further investigation of the intervention and the use of social communication skills in a variety of settings. Addressing the development of social communication skills in the employment setting will promote positive outcomes for adolescents with ASD. In addition, subsequent iterations should also address the use and interpretation of non-verbal communication skills as such skills are critical for success in adult settings. This preliminary use of strategies from the *Social Thinking* curriculum to increase the employability of adolescents with ASD holds promise for the field and may benefit the long-term outcomes of adults with ASD.

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