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Effects of Task Analysis and Self-Monitoring for Children With Autism in Multiple Social Settings

Daniel Parker¹ and Debra Kamps²

Abstract
In this study, written task analyses with self-monitoring were used to teach functional skills and verbal interactions to two high-functioning students with autism in social settings with peers. A social script language intervention was included in two of the activities to increase the quantity of verbal interaction between the students and peers. Analysis of the results leads to the conclusion that the intervention package increased independent task completion, peer-directed verbal interaction, and activity engagement for the students with autism during social, game, and cooking activities. Improvements in task completion persisted after the written task analyses were faded. The percentage of intervals with appropriate language use remained consistent as the social scripts were faded during the game activities.

Keywords
autism, task completion, self-monitoring, social settings, elementary ages, peer groups

Children with Autism Spectrum Disorders have a significantly restricted range of social communication and initiation skills to engage in reciprocal interactions with peers (Volkmar, Carter, Grossman, & Klin, 1997), with reported aloof, active-but-odd, and passive behaviors (Beglinger & Smith, 2005; Borden & Ollendick, 1994). In light of the core deficits in social and verbal communication, researchers have explored interventions specifically to improve verbal communication in social activities with peers. Examples of interventions include task analysis, visual/picture cuing systems, and self-management strategies.

After a task analysis, students are taught to refer to a list of steps to follow to complete a task and, in some cases, to check (self-monitor) each step’s completion. Anderson, Taras, and Cannon (1996) define task analysis, also called step analysis, as the delineation of a complex task into smaller, more manageable steps. Students are taught to chain the steps together from beginning to end, backward, or in small clusters, through the use of modeling, graduated guidance, and varying degrees of prompting procedures to teach individual steps. Modest resources are required to complete a task analysis, and they can be completed across a large array of settings and activities. The application of task analysis and prompt fading to change behaviors has been successfully demonstrated in numerous studies (Garff & Storey, 1998; McAdam & Cuvo, 1994). Despite the potential utility, there are few reports in which researchers have examined the use of a task analysis as a self-monitoring device for students with disabilities (i.e., teaching students to mark off steps as the student performs the skills outlined in the task analysis). In one example, Gaylord-Ross, Haring, Breen, and Pitts-Conway (1984) designed a social skill intervention that utilized a task analysis to teach leisure skill activities (e.g., use of a handheld video game) to two high school students with moderate to severe intellectual disabilities. Although those students did not use the task analysis as a self-monitoring tool, both of the students with disabilities generalized social use of the leisure objects to novel peers, and one student was able to generalize some of the interaction skills that were embedded in the task analysis, even when no object was included in the generalization probes.

In addition to task analysis, activity schedules and social scripts (e.g., Bryan & Gast, 2000; Krantz & McClannahan, 1993; Loveland & Tunali, 1991; Thiemann & Goldstein, 2004) have been used to promote social and communication skills in students with autism. Krantz and McClannahan

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(1998) reported the ability of three children with autism to initiate social interactions with adults when a textual script was embedded in their photographic activity schedules. Pierce and Schriebman (1994) similarly reported a variety of daily living skills that could be taught to students with autism using a pictorial self-management system. Routines such as setting the table, getting dressed, and making the bed were taught using picture cues as a stimuli to teach the corresponding behavior. The authors also showed the utility of the pictorial self-management system by changing the pictures in the schedules so the students could follow novel routines once use of the picture schedule was learned. Self-management intervention has been shown by many researchers to be effective in increasing skills and interactions as well. For example, Koegel, Koegel, Hurley, and Frea (1992) used a portable self-monitoring device worn on the wrist to increase social responsiveness in four students with autism ranging in age from 6 to 11 years.

Researchers also have shown the effectiveness of visual- cuing and social-scripting strategies in groups including typical peers. In an early study, Strain, Kohler, Story, and Danko (1994) reported the effective use of a self-management strategy (i.e., placement of small photo of the child into a container with each use of a social skill) with young children with autism in multiple settings. The child’s use of self-management was shown effective at increasing the social interactions between preschoolers with autism and general preschool peers within school and home settings. Kamps and colleagues (1998, 2002) have shown that using visual prompting systems with peers as prompters are effective for increasing engagement and verbalizations in social activities. Licciardello, Harchik, and Luiselli (2008) also demonstrated the effectiveness of using peers to prompt social interactions in natural settings. Other researchers have shown the use of text cues and social scripts (Thiemann & Goldstein, 2004); picture cards (Kohler, Greteman, Raschke, & Highnam, 2007); written social stories serving as scripts (Delano & Snell, 2006; Scattone, Tingstrom, & Wilczynski, 2006); video modeling (Bellini, Akullian, & Hopf, 2007; Maione & Mirenda, 2006); and video enhanced activity schedules (Kimball, Kinney, Taylor, & Stromer, 2004) to be effective interventions for increasing engagement in functional activities and social interactions with peers.

Clearly, the brief literature review confirms positive instructional outcomes when self-monitoring strategies, task analysis, and scripts are utilized with children with autism. The purpose of the current study was to test the effects of the use of task analysis with added features of self-monitoring and prompting for verbalizations with peers in three separate social activities, as well as to determine maintenance and generalization of task completion and communication when the visually presented task analysis was systematically faded. A second purpose was to test the effects of the use of social scripts in two of the three activities as an added component of the intervention to increase appropriate language with peers during sessions and to fade the social scripts to increase independent language use. The study was designed to add to the literature in which researchers demonstrate effects for multicomponent interventions, those designed to combine single effective strategies into “packaged” interventions to improve their impact on the performance of children with autism in social activities with typical peers. Independent completion of the task steps, peer-directed verbalizations, and activity engagement were measured outcomes of this intervention package.

**Method**

**Participants and Settings**

**Students with autism.** Two students with autism, Robert and Maria, participated in this study. Both students were nine years old, attended public schools, and had a diagnosis of autistic disorder. The diagnoses had been given by clinical psychologists several years prior to the study. No IQ scores were made available; however, both participants were considered to be high functioning by their teachers. Robert and Maria were able to decode reading passages approximating grade level, and they had approximate grade level skills for most rote academic skills such as spelling, addition, subtraction, writing names, and copying short sentences. Both students made between 3- and 5-word spontaneous initiations and could respond appropriately to yes/no questions about their environment. Maria often perseverated on inappropriate topics (i.e., wanting to wear glasses, wanting to be a baby), whereas Robert appeared more withdrawn and rarely conversed with adults or general education peers even when others initiated conversations with him. Teaching staff reported that the students rarely played with other children on the playground or during free time. In addition, Robert and Maria engaged in verbal and postural stereotypy in home, school, and community settings. The students had previous exposure to social skill interventions, but they continued to exhibit deficits in communication across multiple settings. Parental consent and child verbal assent were obtained before this study began.

**General education peers.** Robert and Maria each had his/her own separate peer group for all social activities. For the study, volunteers were recruited from each student’s respective general education classroom to form peer groups. Maria’s peer group \( n = 6 \) consisted of all girls ranging in age from 8 to 9 years. Robert’s peer group \( n = 9 \) included both boys and girls ranging in age from 6 to 9 years. Two or three peers at a time participated in each of the activities with Maria and Robert. Parental consent and child assent were obtained for the neurotypical peer participation in the study.
Treatment providers and observers. The treatment providers and observers included (a) the first author (experimenter), who had worked as a paraprofessional with both Robert and Maria prior to this study; (b) an undergraduate research assistant with no prior contact with the students with autism or their peers; and (c) the second author, a PhD-level associate who worked with a university-based research organization.

Settings. This study began in the summer, while both students attended the public school’s summer school program for children with autism, and continued into the school year. Each student spent time in a special education classroom and a general education classroom. The activities for the study for Robert (games and cooking), however, were conducted in a separate area in the school, away from the classrooms. Activities occurred during the school day in the summer and after school in the fall. The games and cooking activities for Maria took place at her home after school during the summer and fall. A variety of community fast-food restaurants were used for the third activity setting. Transportation to Maria’s home and to restaurants for all participants was provided by the researchers with parent permission. Some peers lived in close proximity and were able to walk to Maria’s house after school.

Materials

Social activities. Games, cooking, and restaurant activities were chosen by the teacher for the students based on input from the parents and teachers of the children with autism and were seen as beneficial for teaching functional skills that could generalize across school, home, and community environments. The inclusion of peers provided a social context for the functional activities. During the game activity, students chose from three similar games: Trouble®, Sorry®, and Topple®. In the cooking activity, some of the materials differed between the two students based on the setting for this activity. For Maria, the oven, timer, bowls, and utensils in her home kitchen were used. Robert’s cooking activity took place in the school and utilized a toaster oven to bake the food items as well as timer, bowls, and utensils provided by the experimenter. The cooking activity for both students allowed for a choice of three recipes, each written on a 4 × 11 inch piece of construction paper that gave step-by-step instructions on how to make brownies, chocolate chip cookies, or peanut butter cookies. Each recipe contained 12 or 13 steps, and the three were considered of equal difficulty. For the restaurant activity, all participants were given two dollars to independently order a small drink and choice of side order using the overhead menus at the restaurants.

Task analysis materials. A task analysis that sequentially outlined the steps needed to complete an activity was created for each of the three activities. The task analysis for each activity was printed on 8.5 × 11 inch typing paper and laminated. Each step on the task analysis was composed of a number followed by an instruction. An empty box was placed to the left of the number so that students could check the box once the step had been performed. In total, there were 8 steps on the task analysis to complete the game activity, 22 for cooking (19 for Maria at home with the adult controlling the kitchen oven for baking), and 12 for the restaurant activity. In addition to directions for engaging in the activity, each task analysis included at least 2 or 3 steps that required verbal responses from the students. For example, a step on the task analysis for games directed the students to “Talk to friends.” Ten social comments to facilitate verbal responses were written on a single “language card” that was placed in front of the participants with autism for use during these steps, including such comments as “What game do you want to play?” or “I want to make chocolate chip cookies.”

Social scripts materials. The purpose of the language card was to remind the students with autism to talk during the games activity and give them examples of appropriate social comments. The language card was discontinued after ten intervention sessions in Robert’s games activity because of the high degree of experimenter prompting that was required to direct Robert to refer to the card. In addition, Robert often read only the first one or two comments on the card, and so the comments were not varied and became repetitive. The experimenter also wanted to increase the frequency and topography of peer interactions toward the student with autism, and the language card did not facilitate that outcome. Therefore, the researchers revised the language card component to include the use of social scripts for the “Talk to friends” step in the task analysis. Rather than a single language card with a list of 10 social comments, 25 separate “social scripts” cards were introduced, each with single comments or questions for conversations. Each script was written on approximately 1 × 6 inch strips of paper that could be read by either the students with autism or their peers. Many of the scripts were written based on activities of interest to Robert and Maria. In addition, the peers and students with autism gave feedback to develop some of the scripts based on other interests. The scripts also included specific comments related to the various games and activities during the group. Examples included: “This is a fun game.” “If you get a six, you go again.” “OK, guys, let’s try not to knock it over.” “What is your favorite restaurant?” “Do you want to go outside later?” “My favorite movie is . . .” The 25 scripts were rotated randomly each session. Scripts were used by the target students and their peers starting with 6 per student, increasing up to 10 per student per session. The students and peers were allowed to read a social script at any time during the game or restaurant sessions once the social scripts were distributed. To self-monitor the use of the social scripts, a record sheet, consisting of from 6 to 10
boxes, and a marker were given to the students with autism and their peers.

Social scripts were implemented for Robert in Session 15 for games and used to start the first activity (games) for Maria once she began intervention in Session 5. In addition to implementing the social scripts in the games activity, they were included when use of appropriate language did not improve from baseline. This occurred in the intervention phase of the restaurant activities for Robert (the 9th session in that activity) and Maria (the 11th session in that activity). The scripts were not used in either group’s cooking activity because appropriate language use improved over baseline with the language card.

Experimental Procedures

Baseline. Baseline for the games and cooking activities was arranged such that the students and peers were given the direction to stay at a table that contained all of the materials needed for the corresponding activity (choice of games, cooking materials, recipes, etc.). A timer was set for 15 min. Before starting the timer, each student selected a choice for a break activity (e.g., video games, free time, playing football/outside, stickers) to engage in after the timer went off. Access to the break was not contingent on completion of the baseline activity. The experimenter did not intervene for stereotypic behaviors such as verbal and postural stereotypy during baseline. The only time the experimenter intervened during the 15 min was to redirect students to stay within the activity area.

For the restaurant condition, baseline consisted of giving the participants money as well as instructions on the food and drinks that they could purchase at the fast-food restaurant. The experimenter did not intervene to help students purchase the food items for approximately 3 to 5 min (depending on the length of the line at the counter). If between 3 and 5 min had passed and the students and peers still had not purchased the items, the experimenter intervened with verbal prompts so that the students and peers were able to retrieve their food and drink from the counter. Once the students were seated, the experimenter gave the instruction for the students to stay at the table for 5 min. Once again, the experimenter intervened or interacted with the students and peers only if they needed to be redirected to stay at the table. No break activity was offered during the baseline condition of the restaurant activity because of the temporal difficulties associated with transportation to and from the restaurant.

Teaching use of the task analysis. The primary intervention consisted of a written task analysis that was given to the student with autism to guide her/him through the activity, with the students checking each step as it was completed. Training occurred during one 45-min session in the actual area used for the activity, and it included all peers. The experimenter used graduated guidance, verbal prompts, and positive practice to teach Robert and Maria how to use the task analysis for self-monitoring. During this initial teaching session, approximately 40 or more prompts were provided to both Robert and Maria. Data on the participants’ behavior were not collected during the training session.

After each student independently completed and self-monitored at least 80% of the task-analyzed steps in a given condition (i.e., 3–5 sessions), the peers also were trained to prompt the target students. Peers were trained to use both verbal and nonverbal prompting strategies. Verbal prompts (modeled initially by the experimenter) included saying, “What’s next!” or “What are we supposed to do now?” Nonverbal prompts primarily consisted of pointing to steps on the task analysis and waiting. Because completion of a task-analyzed step was scored only if the student with autism followed the step independently, the peers were taught to avoid premature prompting and wait for the student with autism to independently initiate the step. One way this was done was by teaching the peers to silently count to five before prompting the student with autism. Peers also were taught to use modeling and independent practice to increase students’ independent completion. For example, when the student with autism did not respond or appeared not to know what to do next, peers were instructed to show the student with autism how to perform the step and then to allow the student to practice the step independently. Once peers began prompting, direct prompting from the experimenter to the students with autism was minimal. However, because of erratic verbal stereotypy, Maria occasionally required verbal prompts from the experimenter to help her stay on-task and reduce stereotypy.

Teaching use of the social scripts. The experimenter modeled the use of the social scripts to the students with autism and their peers by picking up one of the social scripts, saying a friend’s name, waiting for him/her to look, reading the script, waiting for an answer (when appropriate), placing the script in the discard pile, and checking one box on the recording sheet. Modeling was provided until the students and peers were able to use the social scripts correctly and independently, approximately three sessions each for Robert and Maria’s groups.

Intervention sessions. Each intervention session lasted approximately 30 min. During the first few sessions of the intervention, the experimenter gave explicit verbal and physical prompts to the students with autism to continue teaching self-monitoring using the task analysis. Prompting was provided to both students in 2 to 5 sessions for the games and cooking activities. Prompting by the adult continued as needed during the restaurant activity. The peers also served as prompters for the completion of the steps in
the activity and as conversation partners (to initiate and to respond to the students with autism).

At the end of each session (i.e., once all the steps in the task analysis were completed), each student was given a choice of preferred activities for a break taken with her/his peer group. These were the same choices used during baseline; however, during intervention, obtaining the break was contingent on completion of the activity. Once again, no break was provided in the intervention condition of the restaurant activity because of the temporal difficulties associated with transportation to and from the restaurant.

**Fading task analysis and social scripts.** Once the students with autism were able to successfully and independently self-monitor using the task analysis of the activity, the written steps were gradually faded by incrementally eliminating the last few words on each written instruction of the task analysis. As an example, the four increments of fading for the task analysis of the game are presented in Figure 1. Once students could perform the task analysis without any written prompts other than the boxes and numbers (fourth fade), the written list of steps was removed completely. The experimenter determined readiness for fading based on several consecutive successes with the task-analyzed steps. Fading of the written task analysis began for Robert in Session 16 of games and ended in Session 25; for cooking, fading began in Session 10 and ended in 18. For Maria, fading of the written task analysis in the games activity began in Session 14 and ended in 20; for cooking, fading occurred from the 16th to 23rd session in that activity.

Fading of the social scripts differed from fading of the task analysis component. Instead of fading the text on the social scripts as in the task analysis, the number of social scripts given to the students and peers was decreased, whereas the number of social interactions the participants had to record on their record sheets remained the same. Thus, at one point in the fading procedure, each member of the group may have been given 7 social scripts but had to fill out 10 boxes to record social initiations. The timeline of the fading of the social scripts for Robert ran from Sessions 22 through 27 in the games activity and from Sessions 14 through 23 for Maria. Initial fading of the social scripts for Maria in the restaurant began in the 13th session in that setting, but the study concluded prior to complete fading. Eventually none of the students or peers were given social scripts and were required to record 10 interactions on their record sheets during the game activity. The recording sheet was never faded out as part of this study.

**Design**

A multiple baseline probe design (Baer, Wolf, & Risley, 1968; Kazdin, 1989) across three activities was used to demonstrate treatment effects. The activities consisted of playing games, cooking, and eating at a restaurant. Robert and Maria constituted two separate cases utilizing two separate peer groups, thus there was a replication of the experimental design.

Data for the number of completed steps in each task analysis were used as criteria for implementing the intervention in the next setting within the multiple baseline design. After a minimum of 3 sessions with at least half of the task-analyzed steps completed independently, the intervention package was implemented in the second activity. When the
student met criteria in the second social activity, the intervention was implemented during the third activity.

Data Collection

The experimenter used a small video camera to record all sessions during the study so that data collection could occur at a later time. The video camera was set on a tripod for cooking and game activities and held by the research assistant at restaurants. Students became accustomed to the video camera very quickly. The primary dependent variable consisted of task completion measured as the frequency of completed steps on the task analysis. A “+” indicated successful completion and was given if the student independently initiated the step within 30 s of completing the previous step and was engaged with either a peer or activity materials for an average of 7 out of every 10 s required to finish the step. There was no time limit to finish any step, as long as the participant remained engaged.

Peer-directed verbalizations. The percent of intervals with peer-directed verbalizations was measured as a collateral effect of the intervention. Data on peer-directed verbalizations were collected in 10-s intervals and scored whenever the student with autism made an appropriate verbalization directed toward a peer within the interval. Stereotypic or inappropriate verbalizations were not counted as peer-directed verbalizations. Verbalizations were not used as criteria for determining when to intervene in the second and third activities. However, this measure was used to determine the need for the addition of the social scripts enhancement to the intervention package for two activities.

Activity engagement. The percent of activity engagement also was monitored as a collateral effect for the intervention. Activity engagement was defined as appropriate student engagement with a peer or materials for at least 7 s of a 10-s interval. To determine this, when the child stopped engagement, researchers noted the number of seconds elapsing in disengagement before the next 10-s interval started. Activity engagement included intervals when the students were (a) verbally engaged with a peer about the activity or engaging in an appropriate conversation topic not related to the corresponding activity (e.g., talking about what they wanted to do after finishing the activity, topics related to leisure activities), and/or (b) nonverbally engaged with peers or the activity (e.g., watching a peer take a turn, reading the task analysis or social script, manipulating the materials appropriately, following the steps in the task analysis). For each session, activity engagement and peer-directed verbalizations were measured for only the first 15 minutes of the cooking and games activities and for the first 5 minutes of the restaurant activity (once the group was seated). This difference in measurement time for the restaurant activity engagement was because of the shortened amount of time at the table following waiting in line and ordering. Because the length of time was different, percent of intervals was used as the metric for these two collateral behaviors.

Interobserver agreement (IOA) was obtained by having the undergraduate research assistant score at least 25% of the sessions in each treatment condition. Prior to collecting data for reliability, the experimenter reviewed behavioral definitions with the undergraduate research assistant, and the behaviors were discussed following observation of the students during several sessions. A practice scoring session was conducted with additional discussion of the definitions. Then the experimenter and research assistant viewed and scored the videotapes simultaneously, but independently.

For the interval data, if a response was scored within the same or one frame (10-s interval) of the other observer, that response was counted as occurring for both observers within the same interval. This procedure was used to account for behaviors that occurred within 1 to 2 seconds of the next 10-s interval. The number of agreements was then divided by the total number of intervals and multiplied by 100%. IOA for peer-directed verbalizations in baseline ranged from 92 to 99% and from 83 to 88% in intervention. IOA means for Robert were 92%, 96%, and 94% in baseline and 87%, 88%, and 83% in intervention respectively, for games, cooking, and in the restaurant. Maria’s baseline IOA means were 93%, 94%, and 99%, and her intervention means were 86%, 87%, and 84% across tasks. IOA for activity engagement in baseline ranged from 81 to 100% and from 91 to 100% in intervention. Robert’s baseline IOA means for engagement were 87%, 92%, 100% respectively, for games, cooking, and in the restaurant; intervention means were 98%, 99%, and 100%. Maria’s engagement IOA means in baseline were 84%, 81%, and 95%; intervention means were 96%, 91%, and 100% respectively across tasks.

For the task analysis data, each step was coded as an agreement or disagreement. The number of agreements was then divided by the total number of steps and multiplied by 100. IOA for the task analyses was 100% for both students across all phases.

Results

Overall, for both Robert and Maria, the use of self-monitoring on the task analysis resulted in higher levels of task completion across all three activities. Activity engagement and peer-directed verbalizations also increased from baseline when either the task analysis or the language social script intervention was in place.

Completion of Steps in the Task Analysis

Figure 2 offers a graphic representation of Robert’s completion of steps on the task analysis using self-monitoring and the language card (or social scripts) for all three activities. The total number of steps completed on the task analysis...
During the games activity increased from 1 per session during baseline to an average of 7 in intervention (8 possible steps). There was only a marginal difference between means for the original language card intervention ($M = 6$) versus the revised social scripts ($M = 7$) during the games activity.

During the cooking activity, Robert’s average number of completed steps increased from 0 during baseline to 17 during the task analysis intervention (22 possible steps). The number of steps completed in the restaurant activity also increased from the baseline mean of 3 per session to 5 in intervention (12 total steps). Because the social scripts were used only in the last session of the restaurant intervention, there were not enough data points to report any effects for the social scripts in combination with the task analysis in this setting.

For Maria (see Figure 3), when the written task analysis with self-monitoring and social scripts were implemented jointly in the games activity, completion of steps increased from an average of 1 step during baseline to 7 steps during intervention (8 possible steps). During the last five sessions, Maria completed the games task analysis with 100% accuracy. When the intervention package was introduced in the cooking activity, Maria’s average number of steps completed (19 possible) increased from 0 during baseline to 14 during intervention. This trend also was seen in the restaurant social skills activity (12 possible steps). The average number of steps completed increased from 3 during baseline to 6 during intervention. With the implementation of the social scripts during the 11th session in that setting, the mean number of completed steps increased, but with a great deal of variability.
Activity Engagement

Robert’s activity engagement in the games increased from 87% in baseline (range = 74–100%) to 98% during intervention (range = 88–100%). There was no observable difference in engagement when the language cards were used versus the social scripts. During the cooking activity, Robert’s engagement rose from 24% in baseline (range = 11–51%) to 98% during intervention (range = 93–100%). The percentage of time that Maria was engaged in the games activity increased from a mean of 64% during baseline (range = 39–94%) to 97% during intervention (range = 71–100%). Activity engagement also increased in the cooking activity from a baseline mean of 31% (range = 9–63%) to 88% during intervention (range = 66–100%). Because engagement during the restaurant activity included sitting at a table and eating with peers as appropriate, both Robert and Maria displayed more than 95% engagement in both baseline and intervention sessions.

Peer-Directed Verbalizations

As depicted in Figure 4, Robert’s verbalizations during baseline in the games activity averaged 34% as compared to 49% throughout intervention. There was no difference in peer-directed verbalizations between the original language card ($M = 47\%$) and the social scripts ($M = 49\%$) interventions that were implemented along with self-monitoring following the task analysis. However, the variety of social utterances appeared to expand when the social scripts replaced the language card. For example, while playing the games, Robert repeatedly read the same 2 or 3 comments from the language card versus reading and responding to more than 20 different comments and questions using the social scripts. When the task analysis with self-monitoring and original language card was used in the cooking activity, peer-directed verbalizations increased from a baseline mean of 18% of intervals to 51% during intervention. Because of the low number of outings ($n = 4$) to the restaurant and the use of social scripts only in the last session, no clear difference in the peer-directed verbalizations was noted across conditions, and the percentages remained low.

Maria showed increases in peer-directed verbalizations in both the games and cooking activities once the intervention package was initiated (see Figure 5). For the games activity, Maria’s average percentage of verbalizations increased from 22% during baseline to 41% when the intervention was in place. In the cooking activity, Maria’s peer-directed verbalizations in baseline showed a declining trend with an average of 9%, which increased to 31% during intervention. Maria displayed little peer-directed verbalization in the restaurant activity in baseline ($M = 2\%$). Verbalizations increased during the first four sessions of the intervention phase to an average of 9.5%, and increased to 57% using the social scripts across the last five sessions.

Discussion

The use of task analyses with self-monitoring by two children with autism was examined across three social tasks with peers. The use of social scripts also was examined for two of the tasks for each child to determine effects on the quantity of verbalizations with peers. Analysis of the results shows that the task analysis and self-monitoring intervention increased the number of steps that each student was able to perform independently for three social activities with peers for Maria and for two activities for Robert. Thus
the students were better able to follow a social activity sequence from beginning to end. In addition, self-monitoring using the task-analyzed activity steps and language card alone increased both students’ activity engagement and peer-directed vocalizations for the cooking activity. The subsequent change to “social scripts” resulted in increases in activity engagement and peer-directed verbalizations for Maria in the games and restaurant activities and somewhat for Robert in the games activity. Robert’s language had increased initially using just the written task analysis, self-monitoring, and language card, but then it began to decrease. It increased again using the social scripts. Unfortunately, the study was discontinued because of the end of the school year before any change in verbalizations could be seen for Robert in the restaurant using the social scripts. Scrutiny of the findings also revealed that the task analysis procedure was able to be completely faded from two of the tasks, and both students were able to continue to complete activities. Similarly, the use of social scripts was completely faded in the same task for both students (i.e., games). Students continued to use a self-monitoring component (check boxes for verbal interactions) and were able to maintain increased language use over baseline levels. The demonstration of fading of the intervention with maintenance of skills is an additional contribution of the study.

**Student Outcomes**

The written task analysis of activity steps and self-monitoring served as an effective road map for the students with autism to navigate through a variety of social scenarios. Moreover, social interactions such as “What game do you want to play?” and “What do you want to cook?” were embedded in the task analysis and learned by the students in a similar way that “Look” and “Watch me” were embedded in photographic activity schedules by Krantz and McClannahan (1998). The intervention also taught the students game skills in initiating, organizing, and putting away the game, in addition to maintaining game playing and turn taking. The most dramatic improvements were seen in the cooking activity for both Robert and Maria, where activity engagement, peer-directed vocalizations, and completion of the cooking task were markedly improved using just the written task analysis, self-monitoring, and language card intervention.

Unfortunately, there were not enough data points to observe a noticeable trend in behavioral improvement during the restaurant activity. Few data points were collected in restaurants for both Robert and Maria, and the busy nature of the setting proved difficult for providing independent practice and graduated guidance for ordering, waiting in line, and getting the food. Researchers must allow for more time to conduct interventions in multiple settings, and consider multiple trainers in busy settings. In addition, future researchers examining social community skills may attempt to role-play scenarios in a more controlled environment for a few sessions as a way of priming setting-specific behavior before attempting to use the skills in the community (Frederick-Dugan, Test, & Varn, 1991). Even though Robert and Maria were not able to fully master and then fade out the task analysis for the restaurant activity, they did display progress in learning the steps on the task analysis with minimal experimenter intervention. An encouraging finding with the written task analysis used by Robert and Maria was that it was able to be faded in a similar way to the fading of photographic activity schedules and social scripts in prior research (Bryan & Gast, 2000; Bryan & Gast, 2000; Bryan & Gast, 2000;
Clarke, Dunlap, & Vaughn, 1999; Krantz & McClannahan, 1993; Pierce & Schreibman, 1994).

Similar to prior research on the use of visual cuing strategies such as pictures and text to teach children with autism to relate to stimuli in their environment (Clarke et al., 1999; Krantz & McClannahan, 1998; McAdam & Cuvo, 1994; Storey & Garff, 1997; Thiemann & Goldstein, 2001), an exciting finding in this study was improved conversation skills for the students, due in part to the social scripts added as a component of the intervention in two settings. For example, once all of the social scripts were faded and Maria was required to make at least ten initiations or responses to peers, she consistently began to use verbalizations that she first heard used by one of her peers. Thus if one of her peers asked, “Maria, do you like math or science better?” (not scripted), after appropriately responding to the peer who asked the question, Maria would then turn to a third peer and ask, “Donna, do you like math or science better?” The experimenter also observed improved quantity and variety in Robert’s language when the social scripts were implemented following a downward trend in language during the game activity. Advantages of the social scripts used in the study were that (a) some were developed by the experimenter to be of interest to the students with autism, (b) many were developed by the students and peers themselves, and (c) many were related to the activities themselves—all features to incorporate an element of contextual fit and social validity to the scripts. A limitation is that this component was not implemented across all three activities. Future research with additional measures of language may help determine whether this type of learning is common when social scripts are used. This might include language transcripts to determine novel language use beyond trained phrases, which would add additional validity to the intervention and use of scripts for children with autism. Other researchers may want to examine if the social scripts recording sheets also can be faded, in addition to the actual scripts, while maintaining high levels of conversation between peers and children with autism. Implementation of this procedure with more specific criteria for mastery and with more consistency throughout a multiple baseline design would help to determine more clearly the effects of this intervention.

A final outcome is that the present study further adds to the current research on the utility of peer-prompting interventions (Goldstein, English, Shafer, & Kaczmarek, 1995; Kamps et al., 2002; Sasso & Rude, 1988). The peer groups for both Robert and Maria were able to help the students learn to use both the written task analysis and the social script interventions. Anecdotally, the experimenters observed that the majority of time spent with the peers throughout the study was focused on teaching them appropriate prompting and social interaction strategies (Pierce & Schreibman, 1997) such as eye contact, turn taking, and verbally reinforcing social interactions and activity engagement to help the students with autism follow the task analysis for each activity. In particular, the experimenter frequently prompted the peers to allow “wait time” for the students with autism to perform steps on the task analysis independently so that they could reach mastery of the steps. This procedure is similar to time delay procedures demonstrated as effective in prior research (e.g., Schuster et al., 1998). Additional measures of social behavior (e.g., turn taking, sharing, assisting) in future studies would determine if multicomponent interventions in peer groups improved those behaviors as well.

**Limitations**

A primary limitation of the study was the small sample size. Because this study examined intervention effects on only two participants, it is difficult to predict if the interventions used would be effective for similar students with autism, lower functioning students with autism, or students with other social deficits. A second limitation is the short number of sessions in the third activity at the restaurant. Task completion, activity engagement, and appropriate language improved during the third activity (restaurant) for Maria, though the task analysis steps were not mastered and social scripts appeared to be a necessary enhancement for both task completion and language. Additionally, the linear improvement in task completion during baseline and the extreme variability in intervention data limit the conclusions that can be drawn for Maria in the restaurant activity. Similarly, analysis of the multiple baseline graphs for Robert shows experimental control across only two activities, diminishing conclusions that can be drawn for him as well.

Other limitations that must be considered include that peer prompting and adult prompting were not measured. Fidelity in the peers’ implementation of prompting, modeling, independent practice, and wait time may have shown differences in successful completion of the steps in the task analysis, activity engagement, and peer-directed verbalizations for various combinations of peer groups. Robert’s group was able to perform the games and cooking activities with the experimenter not present in the room; however, Maria required consistent monitoring. As an intervention package was used in this study, future studies are needed to address the influence of additional strategies (e.g., peer prompting, reinforcing activity contingent on completion) for supporting successful participation with peers. Although social validity measures were not collected during this study, sociometric ratings for the target students by classmates as a way to determine if peers were more accepting outside of the intervention settings, could be incorporated into future research. A final limitation of this study is that generalization and maintenance probes were not conducted;
however, fading of both written task analysis steps and social scripts occurred for two of the three activities for both students, suggesting maintenance of skills on a short term basis. Evaluation of the generalization of language and interaction skills to untrained settings would enhance future studies. In addition, studies determining the most efficient training procedures and additional social problem-solving skills would add to our knowledge of acquisition and generalization of social competence for students with autism.

**Conclusion**

In this study, two students with autism were taught three highly functional skills (i.e., games, cooking, and ordering/eating in restaurants). Written task analyses with self-monitoring in social activities with typical peers were found to be a promising intervention for increasing independent task completion. The addition of social scripts appeared to increase communication with peers, but insufficient data were collected. Thus, this component is promising but needs additional study. Recommendations include continued use of visual task analysis of activity steps and self-monitoring to promote improved task completion and verbal interactions of children with autism in natural settings with typical peers; additional research using social scripts in peer groups is necessary.

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