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Using Social Stories and Visual Schedules to Improve Socially Appropriate Behaviors in Children With Autism

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The current study investigated the effects of Social Stories written according to Gray’s specifications on on-task behavior in inclusive classroom settings in three children with autism. Using a multiple-baseline design across participants, modest improvements in on-task behavior were associated with implementation of an auditory-visual Social Story intervention. In follow-up analysis, the Social Story was replaced with a visual schedule component to augment the effects of Social Stories when there was room for improvement for one participant. Further improvement in on-task behavior indicates that strategies such as visual schedules may be an effective way to augment the effects of Social Stories. An effect size estimate calculated using Parker et al.’s percentage of all nonoverlapping data points procedure revealed a large effect ($d = 1.33$) associated with Social Stories alone, which increased ($d = 1.7$) when the visual schedule intervention applied to one participant was added to the analysis. Although Social Stories produced improvements in on-task behavior in children with autism, additional components, such as visual schedules, may be useful for optimizing performance.

**Keywords:** autism; Social Stories; visual schedules; auditory-visual support systems; challenging behaviors; single-subject research

Individuals with autism often have strengths in memory and the ability to use visual information (Janzen, 2003). For example, individuals may be able to remember information for a long period. Instead of relying on auditory processing or attention, individuals may have the ability to use visual information in a meaningful way. When learning a routine, if the steps are presented in a meaningful sequence with a clear start and finish, individuals may be better able to complete the routine.

Researchers have explored the use of visual support systems to enhance the functioning of children with autism (Charlop & Milstein, 1989; Gray & Garand, 1993; Haring, Kennedy, Adams, & Pitts-Conway, 1987; Krantz, MacDuff, McClannahan, 1993; MacDuff, Krantz, & McClannahan, 1993; Pierce & Schreibman, 1994). These studies implemented visual supports, such as picture prompts, photographic activity schedules, visual schedules, checklists, and videotape modeling.

Carol Gray (Gray & Garand, 1993) developed Social Stories as a strategy with visual components (i.e., pictures or text), to address deficits in social skills in children with autism. Social Stories are short stories that describe a situation or a behavior that may be ambiguous, confusing, or problematic for the individual. Specifically, Gray (1998) stated, A Social Story™ is a short story that adheres to a specific format and guidelines to objectively describe a person, skill, event, concept, or social situation. . . . The goal of a Social Story™ is to share relevant information. This information often includes (but is not limited to) where and when a situation takes place, who is involved, what is occurring, and why. (p. 171)

Social Stories initially were written for children with high-functioning autism to read. They also have been used as an auditory-visual strategy, as adults typically

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read illustrated Social Stories to children with more severe developmental disabilities (Bledsoe, Myles, & Simpson, 2003; Swaggart et al., 1995). The story identifies the situation or behavior and describes appropriate social cues and preferred responses (Gray, 1995). Social Stories are thought to be effective because they address particular behaviors that individuals with autism lack, such as initiating and responding to conversation, changing a routine, understanding how other people may feel or think, and responding appropriately in a social situation.

Despite the popularity of Social Stories, relatively few experimental studies have been completed (see Table 1). Most of the published studies used Social Stories to address challenging behaviors (e.g., aggression, interrupting, tantrums, screaming, hitting), whereas a few have addressed social interaction skills (Delano & Snell, 2006; Soenksen & Alper, 2006; Thiemann & Goldstein, 2001). Among the empirical studies, the implementation of Social Stories differs greatly. The research designs of these studies are also highly variable, ranging from case studies to variations of withdrawal designs and multiple-baseline designs across participants or settings.

Relatively few research studies used Social Stories as the sole intervention (Adams, Gouvousis, VanLue, & Waldron, 2004; Ivey, Heflin, & Alberto, 2004; Norris & Dattilo, 1999; Sansosti & Powell-Smith, 2006; Scattone, Wilczynski, Edwards, & Rabian, 2002). The results of each of these studies indicate that the intervention was successful, but each study has one or more weaknesses. For example, Scattone et al. (2002) evaluated the Social Story intervention using a multiple-baseline design across participants, but one participant had been receiving an on-task behavior intervention that had been implemented prior to the targeted intervention. Adams et al. (2004) and Norris and Dattilo (1999) had only one participant in their studies, and the latter study used a pre-experimental AB design with three different Social Stories. Ivey et al. (2004) and Sansosti and Powell-Smith (2006) each studied the effects of Social Stories with three children, but none of the children was diagnosed with autism, and Ivey et al. incorporated 16 different Social Stories.

The remaining studies implemented other behavioral and visual support strategies to modify behavior either prior to or in combination with the Social Story intervention (see Table 1). Some of these additions were relatively minor (e.g., verbal prompts), whereas others included major additions to the treatment (e.g., reinforcement). The results of each study indicated that the intervention was successful, but it is unclear if the results were because of the unique combination of treatments or the Social Story component in particular.

Several studies have used the earning of points, stickers, or tangible rewards (Agosta, Graetz, Mastropieri, & Scruggs, 2004; Bledsoe et al., 2003; Burke, Kuhn, & Peterson, 2004; Kuttler, Myles, & Carlson, 1998; Moore, 2004) prior to or in combination with the Social Story intervention. In addition, a majority of the published studies included illustrations (e.g., picture symbols, line drawings, photographs of the child) within the story. Other studies included reminders (Bledsoe et al., 2003; Kuoch & Mirenda, 2003) or prompts (Barry & Burlew, 2004; Crozier & Tincani, 2005). For example, Crozier and Tincani (2005) implemented an ABAC design, in which A was baseline, B was the Social Story intervention, and C was the Social Story plus verbal prompts given on a variable interval schedule. The child’s behavior improved during Phase B but improved further during Phase C.

Still other researchers changed the mode of delivery. For example, Brownell (2002) studied the use of Social Stories combined with music therapy, which makes it difficult to attribute effects to Social Story books. Hagiwara and Myles (1999) used a multimedia approach combining Social Stories, visual symbols, and computer-based instruction.

In summary, Social Stories may be effective when addressing challenging behavior in children with autism. However, most of the experimental research combined Social Stories with another mode of intervention (e.g., picture prompts, video modeling, music therapy). Thus, it is unclear if the positive behavior changes are because of the Social Story intervention or the unique intervention combinations. A component analytic approach is called for whereby investigators examine the effects of Social Stories alone and then potentially use that condition as a baseline to examine strategies to enhance behavior further.

In the proposed experiment, Social Stories were read to children with autism to address particular off-task behaviors that were not being addressed by another intervention. The specific questions addressed were as follows:

- What are the relations between Social Story intervention and on-task behaviors?
- If the child does not positively respond to the Social Story alone, or there is room for improvement, can the Social Story be replaced by a novel component to increase appropriate behaviors?

We predicted that the children who read Social Stories would demonstrate increases in the targeted adaptive on-task behaviors. We also predicted that replacing the
### Table 1: Overview of Studies on Social Stories for Children With Autism and Asperger Syndrome

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Design</th>
<th>Target Behaviors</th>
<th>Social Story Plus</th>
<th>Dx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swaggart et al.</td>
<td>1995</td>
<td>AB</td>
<td>Greeting, sharing, aggression</td>
<td>Behavior social skills training</td>
<td>ASD, PDD</td>
</tr>
<tr>
<td>Kuttler, Myles, &amp; Carlson</td>
<td>1998</td>
<td>ABAB</td>
<td>Tantrum</td>
<td>Picture schedule, reinforcement, sticker-and-point chart, token system</td>
<td>ASD, Fragile X, IED</td>
</tr>
<tr>
<td>Hagiwara &amp; Myles</td>
<td>1999</td>
<td>MB across settings and participants</td>
<td>Hand washing, on task</td>
<td>Adapted to computer with video and audio</td>
<td>ASD</td>
</tr>
<tr>
<td>Norris &amp; Dattilo</td>
<td>1999</td>
<td>AB</td>
<td>Social interaction</td>
<td>Three different stories</td>
<td>ASD</td>
</tr>
<tr>
<td>Thiemann &amp; Goldstein</td>
<td>2001</td>
<td>MB across skills and triads</td>
<td>Social-language development</td>
<td>Written text cues, video feedback, paired with two peers</td>
<td>ASD, LI</td>
</tr>
<tr>
<td>Lorimer, Simpson, Myles, &amp; Ganz</td>
<td>2002</td>
<td>ABAB</td>
<td>Interrupting, tantrum</td>
<td>Timer, minischedule, <em>Teach Me Language</em></td>
<td>ASD</td>
</tr>
<tr>
<td>Scattone, Wilczynski, Edwards, &amp; Rabian Brownell</td>
<td>2002</td>
<td>MB across participants</td>
<td>Sitting, staring, shouting</td>
<td>On-task behavior intervention in place prior to study</td>
<td>ASD</td>
</tr>
<tr>
<td>Bledsoe, Myles, &amp; Simpson</td>
<td>2003</td>
<td>ABAB</td>
<td>Spilling food, wiping mouth</td>
<td>Reminders, earned points</td>
<td>AS, ADHD</td>
</tr>
<tr>
<td>Kuoch &amp; Mirenda</td>
<td>2003</td>
<td>ABA, ACABA</td>
<td>Aggression, crying, yelling, eating, playing</td>
<td>Phase C = Social Story + reminders</td>
<td>ASD</td>
</tr>
<tr>
<td>Adams, Gouvouisis, VanLue, &amp; Waldron Agosta, Graetz, Mastroper, &amp; Scruggs</td>
<td>2004</td>
<td>ABAB</td>
<td>Crying, falling, hitting, screaming</td>
<td>—</td>
<td>ASD</td>
</tr>
<tr>
<td>Barry &amp; Burlew</td>
<td>2004</td>
<td>ABCA</td>
<td>Screaming, yelling, crying, humming</td>
<td>2 different stories, verbal praise; Phase B = Social Story + earned “happy face” and candy bears</td>
<td>ASD</td>
</tr>
<tr>
<td>Ivey, Heflin, &amp; Alberto</td>
<td>2004</td>
<td>ABAB</td>
<td>Choice making, appropriate play</td>
<td>3 different stories, verbal/gesture/physical prompt, corrective feedback, verbal praise</td>
<td>ASD</td>
</tr>
<tr>
<td>Moore</td>
<td>2004</td>
<td>ABAB</td>
<td>Preparation for novel event</td>
<td>16 different stories</td>
<td>PDD-NOS, LI ASD, LD, learning disability Disruptive bedtime behaviors</td>
</tr>
<tr>
<td>Burke, Kuhn, &amp; Peterson</td>
<td>2004</td>
<td>ABABAB and MB across participants</td>
<td>Sleep problems</td>
<td>Tangible rewards</td>
<td>ASD, LD, learning disability Disruptive bedtime behaviors</td>
</tr>
<tr>
<td>Crozier &amp; Tincani, Sansosti &amp; Powell-Smith</td>
<td>2005</td>
<td>ABAC</td>
<td>Talking out</td>
<td>Phase C = Social Story + verbal prompts</td>
<td>AS</td>
</tr>
<tr>
<td></td>
<td>2006</td>
<td>MB across participants</td>
<td>Sportmanship, joining in, maintaining conversation</td>
<td>—</td>
<td>ASD</td>
</tr>
<tr>
<td>Delano &amp; Snell</td>
<td>2006</td>
<td>Multiple probe across participants</td>
<td>Seeking attention, initiating comments and requests, making contingent responses</td>
<td>Set of stories, paired with one peer for intervention; read story together; novel peer for generalization</td>
<td>ASD</td>
</tr>
<tr>
<td>Soenksen &amp; Alper</td>
<td>2006</td>
<td>MB across settings</td>
<td>Obtain peer attention; say name, look at face</td>
<td>Paired with two familiar and two new peers; read story together</td>
<td>Hyperlexia</td>
</tr>
</tbody>
</table>

*Note: Dx = diagnosis; MB = multiple baseline; ASD = autism spectrum disorder; PDD = pervasive developmental disorder; IED = intermittent explosive disorder; LI = language impairment; AS = Asperger syndrome; ADHD = attention-deficit/hyperactivity disorder; NOS = not otherwise specified; LD = language delay.*
Social Story with a novel component using a visual schedule as a self-management strategy would further increase or maintain the improvement in adaptive behaviors.

**Method**

**Participants**

Three kindergarten to fifth-grade students participated. The following selection criteria were applied. Participants (a) had been diagnosed with autism, (b) demonstrated off-task problem behaviors and had impaired verbal and/or social communication, and (c) did not receive services or intervention (currently or in the past) for the targeted off-task problem behaviors. A school psychologist diagnosed each participant with autism. A speech-language pathologist diagnosed each participant with language impairment and Nolan with speech impairment. The students attended a school in a low-income neighborhood where 69% of the students were on a free- or reduced-lunch program and 83% were from minority backgrounds. At the start of the study, each student received services in a self-contained classroom. About midway through the study, Jack and Nolan were moved to mainstream classrooms. The move did not affect the percentage of targeted behaviors for either participant.

The participants were assessed using the *Social Skills Rating System* (SSRS; Gresham & Elliott, 1990) and *Oral and Written Language Scales* (OWLS; Carrow-Woolfolk, 1995). The SSRS is a questionnaire focused on the social behaviors of the child and provides a standard score. The classroom teacher completed the SSRS. The first author administered the OWLS, which assesses receptive and expressive language and provides a standard score. Assessment results can be found in Table 2.

Participant 1 (Montel) was an African American male and 10 years 3 months of age. He lived in a single-parent home and was on a free- or reduced-lunch program. He was in the fifth grade and was served in a self-contained classroom with children from third to fifth grade. He was significantly delayed on the OWLS. Montel had difficulty attending to tasks or individuals, transitioning, following directions, controlling impulses, making eye contact, and interacting appropriately with peers. He also demonstrated echolalia, perseveration, and tantrums.

Participant 2 (Jack) was a Caucasian male and 6 years 1 month of age. He was in kindergarten in a self-contained classroom (Room A) for all but 1 hr each day, when he went to a mainstream kindergarten room (Room B). The self-contained classroom had children from kindergarten to second grade. Partway through the study, he moved to the mainstream kindergarten room (Room B) full-time. He was significantly delayed on the OWLS. Jack had difficulty making eye contact, taking turns, waiting his turn without interrupting, interacting appropriately with peers and adults, and following directions. He demonstrated perseveration and tantrums and was physically aggressive with the teacher.

Participant 3 (Nolan) was a Hispanic male and 5 years 2 months of age. He was in kindergarten in a self-contained classroom (Room A) for all but 1 hr each day, when he went to a mainstream kindergarten room (Room C). He was in the same self-contained classroom as Jack. Partway through the study, he moved to the mainstream kindergarten room (Room C) full-time and was assigned by a full-time paraprofessional. He demonstrated higher social functioning than Jack and was delayed on the OWLS. Nolan exhibited self-stimulating behaviors and had difficulty initiating and interacting with peers, making eye contact, following directions, transitioning, taking turns, and staying on task.

**Social Stories and Setting**

The parents, classroom teacher, speech-language pathologist, and first author identified behaviors that were targeted. The behaviors selected tended to distract other children in the classroom, impeded social involvement, and were well suited for a Social Story.

One Social Story was written for each child according to Gray’s (1998) guidelines and included descriptive, perspective, and directive sentences. The Social Story included information about the targeted behavior (e.g., listening to the classroom teacher, sitting in circle), where the routine occurred, and what the teacher might
The child was then asked questions regarding what he thought or feel. Two speech-language pathologists familiar with writing and using Social Stories with children with autism reviewed each story and checked for adherence to Gray’s sentence ratio and guidelines. Each story was considered to have met each guideline and contained the correct sentence ratio.

Each Social Story was printed on 5.5- by 8.5-inch white paper. The title was 36-point Times New Roman font, and the story text was in 20-point font. Pictures were taken from The Picture Communication Symbols Book (Mayer-Johnson, 1981). The pages of the book were laminated and bound with a black binder on the left side. An example of a Social Story and comprehension questions appears in Figure 1.

Observations took place in the computer room for Montel and in the mainstream kindergarten classrooms for Jack and Nolan. During treatment, the Social Story was read to Montel each day in a quiet corner of the computer room a few minutes prior to the activity of interest. The Social Story was read to Jack and Nolan each day in the outdoor hallway outside the child’s kindergarten classroom (Rooms B and C, respectively). The child then participated in the activity in the classroom with the other children.

**Procedures**

During baseline, each participant engaged in the regular classroom routine. Direct interactions with the investigators did not occur.

During treatment, the first author read the Social Story to the participant each day immediately before the routine that was targeted (i.e., morning bell, circle time). The child was then asked questions regarding what he would do next (e.g., “What will you do when it is time for circle?”) to aid in comprehension. If the child correctly answered the question, the first author said, “That’s right.” If the child incorrectly answered the question, the first author opened the story to the correct response and stated the correct response. The first author did not provide any other reinforcement during the Social Story reading. The child did not take the Social Story with him to the routine. The first author then observed the targeted routine but direct interactions with the child did not occur.

**Target Behaviors**

Before the morning bell rang, Montel was allowed to go to the computer room to play games. The primary dependent variable for Montel was preparing to leave the computer room to transition to the self-contained classroom in an appropriate way. On-task behavior was defined as getting his jacket and bag, moving away from his computer and walking toward the line at the door, and standing quietly in line without touching another computer or leaning next to or over another student who was seated at a computer. While standing in line, he could look at nearby computers as long as he did not lean toward the screen or touch it. Off-task behavior was defined as wandering around the room in any direction other than the direction of the door; working at a computer, including the computer he was working at, after the bell rang; standing next to a student at a computer and leaning over to look at the screen; and while standing in line, touching a computer or leaning over to look at a computer. In addition, the time it took for Montel to initially leave his computer was measured during every session.
The primary dependent variable for Jack and Nolan was behaving appropriately during circle time and reading instruction, respectively. On-task behavior was defined as verbalizing only when asked by the teacher, when asked to respond as a group, or by raising his hand and waiting to be called on before speaking; sitting; attending to the teacher by looking at the teacher or the object or person the teacher was attending to; and following directions. Off-task behavior was defined as speaking without raising his hand or raising his hand but not waiting to be called on, rolling or lying on the ground, leaving the group situation without being asked by the teacher, looking away from the teacher but not to the object or person the teacher was attending to, and not following directions. In addition, the number of times Jack spoke out of turn during the 5-min routine was collected approximately every fourth session (totaling 27% of sessions).

At the start of the study, Jack and Nolan were in a self-contained classroom (Room A). Each participated in the morning circle and reading curriculum of a different mainstream kindergarten classroom (Rooms B and C, respectively) for about an hour each day. The observations for baseline and the Social Story intervention took place in Rooms B and C. Jack was moved to a mainstream kindergarten classroom (Room B) full-time at Session 32. Nolan was moved to a mainstream kindergarten classroom (Room C) full-time with a full-time paraprofessional at Session 29. Data were collected for Jack during morning circle, which included lunch count, calendar, counting, and part of the reading curriculum instruction. Data were collected for Nolan only during the reading curriculum instruction when the regular teacher or reading resource teacher was present. The assigned paraprofessional usually sat next to Nolan but occasionally was across the classroom. The presence or absence of the paraprofessional was not dependent on the level of support Nolan needed but was determined by projects the classroom teacher assigned to the paraprofessional.

Data Collection

The first author coded targeted behaviors every 10 s for Montel, because his routine varied in length. The mean length of the computer room routine for Montel was 2.5 min (range = 1.17 to 3.83 min). Targeted behaviors were coded every 15 s for 5 min for Jack and Nolan. If the participant demonstrated only targeted behaviors in an appropriate manner (on task) at the 10- or 15-s interval, a “+” was recorded. If the participant demonstrated any targeted behavior in an inappropriate manner (off task) at the interval, a “–” was recorded. For example, when the bell rang for Montel, he had to complete the routine in the correct sequence for it to be deemed on task. He had to log off his computer, get his jacket and bag, and leave the computer to stand in line. While in line, he had to simultaneously stand quietly and not touch the computers. If he logged off his computer and went to stand in line, the interval was coded as off task because he skipped steps (e.g., get jacket and bag) in the sequence. While in line, if he was standing quietly but touching a computer, the interval was coded as off task. Jack and Nolan needed to simultaneously sit in circle, look at the teacher, and if given any, follow directions. If the child was quietly sitting in circle but looking at his neighbor instead of the teacher, the interval was coded as off task.

Each targeted behavior was graphed as a percentage of intervals of on-task behavior during each session for every participant. Data points collected for baseline and intervention sessions were visually analyzed for changes in level, trend, stability, and variability.

Reliability

Reliability was checked on 25% of the observations by a secondary coder (a master’s student in communication disorders), who was trained to an 80% criterion in two sessions. Reliability was collected during baseline and treatment and was calculated by dividing the number of agreements by the number of agreements plus disagreements. Interobserver agreement was 96% for Montel, 92% for Jack, and 88% for Nolan.

Experimental Design

The effect of using Social Stories alone was evaluated using a multiple-baseline design across participants. Intervention was initiated in a staggered fashion across participants so that one participant served as a control for another participant. If desired behavior change was evident when and only when therapy was initiated and this effect was replicated across three participants, one can be reasonably confident this behavior change was a function of Social Story intervention. Because many previous studies (see Table 1) combined Social Stories and another intervention, this study evaluated the effects of behavior change associated with Social Stories alone in the first intervention phase.

During baseline, the participants engaged in the typical classroom routine. Each participant showed considerable variability but no evidence of improvement during the course of 9, 9, and 39 baseline sessions, respectively.
Follow-Up

Although the Social Story treatment produced clear improvement, the level of performance still left room for a follow-up analysis. Montel’s on-task behavior increased to about 50% following the Social Story intervention, but there was still room for improvement. A visual schedule using the Social Story pictures was added and replaced the reading of the Social Story. Despite the lack of a true experimental design, it allowed for a preliminary evaluation of the potentially promising effect of a pictorial-cuing treatment on the participants’ behavior. A visual-schedule version of Montel’s Social Story was created. The visual schedule, used to evaluate the effectiveness of a second intervention (i.e., pictorial cues), was placed on 6- by 9-inch black foam board (see Figure 2). The visual schedule used pictures and shorter phrases adapted from the original Social Story. Pictures taken from the Social Story were reduced to 1.25- by 1.25-inch cards, laminated, and attached to the board with Velcro. A 3.5- by 5.5-inch clear, plastic envelope was placed in the upper right-hand corner of the board to hold the cards representing Montel’s completion of a task. When Montel completed a step on the board (e.g., log off computer), he would peel off the associated picture and place it in the clear envelope. The first author introduced Montel to the visual schedule during four sessions, and data were not collected. Following the introduction, the first author or the paraprofessional assigned to the computer room placed the board on the table next to Montel, and interactions did not occur. He was able to use the board during his entire routine so he would be able to better self-monitor his actions, as he was able to hold and manipulate the visual schedule throughout the routine.

Treatment Fidelity

To assess the accuracy of the administration of the intervention and the data collection process, treatment fidelity was completed for every session by the first author. Treatment fidelity was calculated by dividing the number of correct steps by the number of correct plus incorrect steps. The mean score for all participants was 98%.

Targeted Behaviors

Percentage of intervals of the “appropriate” targeted behaviors during the routine is presented in Figure 3.

Montel. As shown during baseline, the mean percentage of intervals of on-task behavior or preparing to leave the computer room in an appropriate way for Montel was 29% \((SD = 17.3)\). During Social Story intervention, the mean increased to 50% \((SD = 17.5)\). As can be seen in Figure 3, the number of “low days” (i.e., on-task behavior at or less than 50%) was 100% during baseline and 50% following Social Story intervention. The time to leave his computer decreased after the Social Story was introduced. The median time to leave his computer was 90 s during baseline and 70 s during the Social Story condition.

Jack. During baseline, the mean percentage of intervals of on-task behavior during circle time for Jack was 56% \((SD = 13.6)\). During intervention, the mean increased to 76% \((SD = 10.6)\). The number of low days (at or less than 50% on task) was 22% during baseline and 0% following
intervention. During baseline, Jack was on task only 65% of the time during his best days. The number of times Jack spoke out of turn was recorded during 27% of the observations. During baseline, the mean frequency of speaking out of turn during the 5-min observation period was 1.8 times (range = 0 to 3). Following the Social Story, the mean frequency of speaking out of turn was 1 time (range = 0 to 4).

Nolan. Nolan’s behavior was highly variable during baseline and less variable during intervention. During baseline, the mean percentage of intervals of on-task...
behavior or behaving appropriately during circle time for Nolan was 60% ($SD = 19.4$). During intervention, the mean increased to 73% ($SD = 14.4$). The number of low days was 14 of 39 sessions (36%) during baseline and only 1 of 15 sessions (7%) following intervention, a substantial reduction in behavior variability.

It should be noted that the change in classroom placement did not appear to affect the behaviors of Jack and Nolan (see arrows in Figure 3). In addition, the presence or absence of the paraprofessional did not drastically affect the behavior of Nolan. In baseline, the paraprofessional was absent during two sessions. Nolan’s mean was 61% when the paraprofessional was present and 56% when she was absent. During intervention, the paraprofessional was absent during seven sessions. Nolan’s behavior was at 70% when the paraprofessional was present and 75% when she was absent.

**Follow-up.** Although Montel demonstrated an increase in on-task behavior following the Social Story, there was considerable room for improvement. When the story was transformed into a visual schedule that was available for self-management, the mean percentage of intervals of on-task behavior increased from 50% during the Social Story condition to a mean of 72% (Figure 4). As mentioned earlier, the number of low days was 100% during baseline and 50% following Social Story intervention. This continued to decrease to 10% during the visual-schedule follow-up. The time to leave his computer decreased from 70 s during the Social Story condition to 40 s during the visual-schedule condition.

**Effect size.** The percentage of all nonoverlapping data points (PAND) was calculated to determine the effectiveness of the Social Story treatment (Parker & Hagan-Burke, 2007; Parker, Hagan-Burke, & Vannest, 2007). PAND, a new approach to calculating effect sizes, is a major improvement on the percentage of nonoverlapping data points, as all baseline data points from every participant are used instead of the most extreme data point. Moreover, one can convert Pearson’s Phi into a readily interpretable effect size (Cohen’s $d$). Using Parker and Hagan-Burke’s (2007) procedures, we calculated PAND and Phi with the percentage of intervals of on-task behavior for every participant. The overall PAND comparing baseline and Social Story conditions was 78%. Following Parker’s (Parker & Hagan-Burke, 2007) cross-tabs analysis, a large effect size was revealed ($d = 1.33$). When data for the visual schedule condition were substituted for the Social Story condition, PAND increased to 83% and the effect size increased to $d = 1.7$.

**Discussion**

The present study showed that classroom on-task behavior could be improved using Social Stories. The fairly high degree of variability in these behaviors
contributes to the conclusion that Social Story effects are modest. In the case of Montel in particular, it is clear that effects of Social Stories alone, although evident, were far from optimal. Nevertheless, when we quantified the size of the effect using the PAND analysis, a rather large effect size was revealed ($d = 1.33$).

The initial treatment phase in this study confirms the results of the few other experimental studies (Adams et al., 2004; Ivey et al., 2004; Sansosti & Powell-Smith, 2006) that also implemented Social Stories as the only intervention for problematic behaviors. The initial treatment in the present study is most consistent with the results of Scattone et al. (2002) and Sansosti and Powell-Smith (2006). The main difference between Scattone et al. and the present study was the design of the Social Stories. Scattone et al. used a “written script” and did not incorporate pictures. The present study added a non-transient, visual component to Social Stories. Participants may benefit from a visual presentation of the story rather than relying on auditory presentation and memory alone. Sansosti and Powell-Smith included three children with Asperger syndrome. Two of the three participants had highly variable baseline data (as did Nolan in the current study). Following intervention by Sansosti and Powell-Smith, one participant’s variability decreased. The other participant’s variability increased following intervention, but the number of “good days” increased. Nolan’s behavior was similar to the participant in the Sansosti and Powell-Smith study. After the Social Story intervention was initiated, his behavior was still variable, but the percentage of “high days” increased from 64% in baseline to 93% following intervention.

Despite the lack of opportunity to replicate the effects of the visual-schedule component experimentally, useful preliminary information indicates that an extension of the Social Stories to allow for self-management may improve effects versus Social Stories alone. This procedure may be a useful extension of Social Story treatments. At least for target behaviors that involve task sequences that can be pictured easily, this pictorial-cuing approach appears to hold promise. Further experimental analyses are needed to clarify the role of Social Stories with and without intervention components.

In the present study, the amount of change in on-task behavior varied across participants. Montel demonstrated the lowest on-task behavior in baseline and ultimately demonstrated the greatest gain. In contrast to the sequence of behaviors for Montel, the on-task behaviors for Jack and Nolan were nonsequential, as they had to sit quietly on the floor, listen to the teacher, and follow directions. Jack and Nolan were required to sustain appropriate behaviors for an extended time rather than perform a sequence of discrete behaviors. These behaviors may be more susceptible to day-to-day variability.

Following the intervention, Jack behaved more appropriately during circle time. The number of times he lay on the floor and talked out of turn decreased. He started to raise his hand and wait for his teacher to call on him. On occasion, if the teacher was not looking at him when he raised his hand, he would say, “Excuse me.” He looked at the teacher more often and participated during the parts of circle time.

After Social Story intervention, Nolan looked at the teacher more often, responded when called on, and participated in the reading curriculum but would still speak out of turn on occasion. During baseline, his behavior was highly variable. Following intervention, the variability decreased and the occurrence of on-task behavior increased, but the effect was not as strong as it was for Jack and Montel.

The results of this study indicate that the Social Story methods were associated with improvements in on-task behaviors for three children with autism. The stories described behaviors that were appropriate and required in classroom situations. After intervention, the participants were able to respond more appropriately and manage their behavior. Results indicate that Social Stories could facilitate the development of self-management.

**Future Directions**

A number of unanswered questions still need to be addressed. Children with autism disorders display a wide range of abilities. Intervention should be tailored to the individual child, but further information is needed to determine the optimal parameters of Social Story intervention. Future research should examine the effects of reading stories numerous times a day versus once a day (or less frequently) as well as how long the Social Story intervention should last. For example, Jack demonstrated great gains after just 1 week. The time of day the Social Story is read also should be addressed (e.g., at the beginning of the day; immediately prior to the situation, as was done in this study; or during the situation). Subsequent research also may reveal the effects of reading different stories directed at the same behaviors. Previous researchers (Agosta et al., 2004; Barry & Burlew, 2004; Delano & Snell, 2006; Ivey et al. 2004; Norris & Dattilo, 1999) used 2 to 16 stories to address the targeted behaviors. In addition, some investigators have acknowledged that the participants were aware that their behavior was being evaluated and may have self-monitored the targeted behavior accordingly. This confound might be eliminated by having someone who is with the individual on
a regular basis (e.g., paraprofessional, teacher, parent) collect data.

Results for Montel suggest that on-task behavior may increase more for a routine when a student can manipulate pictures representing sequential task components. Future research should evaluate the difference between sequential and nonsequential routines and the effects of static and dynamic Social Story systems. Finally, Gray (1998) outlines a particular sentence ratio to implement when writing Social Stories, but evidence to support this prescriptive approach is lacking. It is unclear if the change in behavior is attributable exclusively to the type of story being read. Children could be read a Social Story with a sentence ratio that differs from Gray’s or a similar story that does not address the challenging behavior to see if either method is effective.

It may be useful to collect data on the same dependent measures for typical peers to use as a normative comparison to determine the extent to which the target children’s performance meets normal expectations. For example, data could be collected for a peer’s on-task behavior during circle time. This would allow one to see how the target student’s behavior compared to that of peers and evaluate the effects of the intervention in the context of what is typical in that specific environment. This would enable one to consider whether the target student’s change in behavior was socially meaningful.

**Limitations of Research**

Although the kindergarten teachers of Jack and Nolan were blind to the purpose of the study, they were not blind to the start of the intervention, as they saw the participants leave the room with the experimenter to read their Social Story after intervention began. They may have systematically changed their behaviors when the child started receiving intervention. This problem could be avoided by taking the children aside during baseline as well as during intervention. In addition, teacher behavior should be monitored more comprehensively during baseline and intervention to see whether there is a change in the way the teacher addresses or treats the child. By taking the child aside during both conditions, one would not expect differential change in the teacher’s behavior as long as the teacher was blind to the purpose of the study and start of intervention. Likewise, the paraprofessional in the computer room for Montel was blind to the purpose of the study but was not blind to the start of intervention. Montel was taken to a corner of the computer room where the paraprofessional could still see him. She did not know the content of the Social Story but was able to see the visual schedule when Montel began using it.

The second intervention (i.e., visual schedule) was not experimentally rigorous, as the prior Social Story condition represented a possible facilitative sequence effect. It is not possible to know the effectiveness of the visual schedule alone. In addition, the effect of the board could not be replicated across all participants. An ABAC design, counterbalanced across participants, also could be implemented with a return to baseline prior to the use of another component, such as a visual schedule. This would more clearly indicate the effect of each treatment phase. The ability of children to generalize targeted behaviors across situations also should be addressed. For example, Jack and Nolan could be followed across the school day to see if their on-task behaviors generalized to other instances of large-group instruction.

In summary, the study demonstrated that improvements in socially appropriate behavior were related to the introduction of auditory-visual Social Stories. In this experiment, Social Stories were read to children with autism, and one child was provided with pictorial cues to address particular off-task behaviors that were not being addressed by another type of intervention. All three children showed improvements with the Social Story alone. One of the children improved further after the format of the story was altered to provide picture cues that permitted self-management.

**References**


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