USING MULTIMEDIA SOCIAL STORIES TO INCREASE APPROPRIATE SOCIAL ENGAGEMENT IN YOUNG CHILDREN WITH AUTISM

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ABSTRACT
The purpose of this study was to examine the effectiveness of the multimedia social stories on the duration of appropriate social engagement of 3 young children with autism. Using a multiple-baseline-across-participants design, the multimedia social stories were implemented, and observations of 10-min play sessions were conducted three times per week. Study results showed an increase in the duration of appropriate social engagement for all participants and two participants also showed generalization to a classroom setting. The results from the study provide support for the use of the multimedia social stories without additional behavioral management techniques in increasing the social engagement of children with autism. Recommendations for future research and potential benefits of the multimedia social story interventions are discussed.
Key Words: Autism; Multimedia Social Stories; Social Engagement; Intervention; Young Children.

Autism is a developmental disability that significantly impacts verbal and nonverbal communication and social/emotional behavior (Koegel & Koegel, 1995). It is best described as a spectrum of disorders since there appears to be great variability in the severity and types of deficit that may be present (Gillberg & Coleman, 2000; Quill, 1997). The most pervasive and universal feature of autism is a deficit in social skills. Indeed, the word "autism" means "within oneself" (Kanner, 1943). Kanner reported, "The fundamental disorder is the children's inability to relate themselves in the ordinary way to people and situations from the beginning of life" (Kanner, 1943, p.242).

The importance of social competence and acquisition of social skills in various domains is not in question. While typically developing children may acquire needed social skills by observing others, individuals with autism frequently have difficulty in social stimuli and social interactions. Wing (1988) classified the social interaction difficulties of individuals with autism into three categories: (a) social recognition, which is described as a lack of interest in others; (b) social communication, which includes trouble expressing one's self and having a limited understanding of body language; and (c) social imitation and understanding, which includes an inability to understand the thoughts or feelings of others or to engage in imaginative play. Unless appropriate social behaviors become part of the child's repertoire, the long-term goal of functioning independently in the community may never be realized.

Since Kanner's (1943) early description of autism, there has been considerable research in identification and appropriate interventions for children with autism. Studies that have focused on cognitive and social competencies of children with autism have noticed strengths in visual-perceptual skills (Lincoln, Courchesne, Kilman, Elmasian, & Allen, 1988: Rodgers, 2000; Siegel, Minshew, & Golstein, 1996) and pictographic stimuli (Garretson, Fein, & Waterhouse, 1990). Visual displays of skill sequences, in particular, have helped with skill acquisition of daily living skills (Pierce & Schriebman, 1994; Roberson, Gravel, Valcanten, Maurer, 1992). Therefore, a social skill intervention that combines visually cued instruction may assist individuals with autism to acquire social skills.

Given the unique learning needs of individuals with autism, social stories may provide an effective strategy to improve social competence. Carol Gray, a special education teacher, developed social stories in order to enable individuals with an autistic spectrum disorder to "read, interpret, and respond effectively to their social world" (Gray, 1994, p.5). A social story is a concise narrative about a situation, concept, behavior, or social skill that is written and implemented according to specific guidelines. Social stories are designed to bring predictability to a situation by providing specific and relevant social cues as well as defining the appropriate responses to a social situation. Social stories try to address both sides of the social equation by improving the social understanding of the child with an Autistic Spectrum Disorder, as well as the person interacting with the child.

The construction of a Social Story uses concrete, easy to understand text enhanced by visual supports. The text and illustrations should reflect the child's reading skills, attention span and cognitive ability. Pictures, maps, photos or symbols used as illustrations are printed in black and white to reduce distractions and limit any unintentional relay of misinformation. The child's needs determine the topic of the story, while the child's

perspective determines the focus of the story. The story is written in the first person, as if the child is telling the story. The social story uses positive language and states desired responses positively.

Gray identified four types of sentences that can be used to write social stories-descriptive, directive, perspective, and control- to explain abstract situations, often trough the use of analogies (Gray, 1997). Descriptive sentences provide information about the behavior of most people in a given social situation. These sentences also identify reasons for certain social behaviors. Descriptive sentences do not give information to the child about expected behavior in the targeted situation, but they appear to be very helpful for the explanation of social events (Gray & Garand, 1993). Directive sentences explain to the child what the desired response to a certain social situation is and what the child should try to say or do in a given situation. Gray suggests that directive sentences are more effective when they are written in positive terms (Gray & Garrand, 1993). Perspective sentences involve incorporating another person's view into the social story. These sentences are designed to enhance the child's understanding of how other people view the targeted social situation. Finally, control sentences provide the child with personal strategies to use in order to recall and apply the given information. The child may write these sentences.

According to Gray (1997), these components should be written in ratio. The basic social story ratio consists of two to five descriptive, perspective, and affirmative sentences for every directive sentence. This ratio exists because it emphasizes one expected behavior at a time. Whereas the first three sentences establish the setting, people's perspectives, and a particular command, the single remaining directive sentence highlights the main lesson-the appropriate behavior for the child. By having this ratio, children with autism focus on one direction at a time.

A growing body of literature has examined the effectiveness of social stories with individuals with autism. Existing literature showed that social stories were effective in decreasing aggressive behavior (Adams, Gouvousis, Van Lue, & Waldron, 2004; Gray & Garand, 1993; Romano, 2002; Rowe, 1999), increasing appropriate behaviors (Agosta, Graetz, Mastropieri, & Scruggs, 2004; Cullain, 2000; Graetz, 2003; Kuoch & Mirenda, 2003, Smith, 2001), increasing the use of appropriate social skills (Barry & Burley 2004; Hagiwara, 1998; Pettigrew, 1998), increasing greeting behavior and initiation of play activities (Feinberg, 2001), increasing on-task behavior (Brownell, 2002), increasing appropriate meal-eating behavior (Staley, 2001) and decreasing precursors of tantrum behaviors (Simpson & Myles, 2002).

In a review of research literature on social stories, Reynhout and Carter (2006) suggested that interpretations of extant studies are frequently confounded by inadequate participant description and the use of social stories in combination with other interventions. The researchers concluded that although social stories stand as promising intervention, further research is needed to determine the exact nature of their contribution and the components critical to their efficacy. In addition, Kuoch and Mirenda (2003) offered a limited review of research of 10 social story interventions. Several limitations in the research were noted including non- conformity of many of the stories with recommended guidelines, flawed and weak research designs and confounding effects as additional interventions were often employed with social stories.

Although an increasing amount of literature suggests that social stories can be effective for individuals diagnosed with autism, many lack rigorous methodological standards and use the social story intervention in conjunction with other treatments, making it difficult to identify the source of the behavioral change. Additional empirical social story research is essential to further develop this promising intervention in the field of autism.

The purpose of this study was to determine if a multimedia social story intervention could increase the duration of appropriate social engagement in young children with autism. This study adds to the literature by introducing a medium of presentation. The multimedia social story intervention allows children to learn new social behaviors through social stories presented on a computer. As multimedia social story intervention uses the characteristics of the social stories in a structured and attractive presentation with visual stimuli and sound made by the computer system. This study also extends to which multimedia social stories effectively increase the duration of appropriate social engagement of children with autism without the addition of planned behavior management systems.

METHOD

Participants

Three children with an existing clinical diagnosis of autistic disorder were participated in the study. All subjects had been found eligible for special education services in their school district under the category of autism as defined by their school based on the federal guidelines. Each child also had the following characteristics: (a)

meet the full criteria for autism according to DSM-IV-TR (APA, 2000) (b) functional verbal communication, (c) able to read and comprehend words at the pre-kindergarten level, as measured by the Peabody Individual Achievement Test, Revised (PIAT-R; Markwardt, 1989), (d) ability to follow directions, and (e) access to peers with inclusive education, (f) fine motor skills that allow for manipulation of a computer, such as moving the mouse or clicking its button.

John was a 6-year, 2-month old Caucasian male, clinically diagnosed with autism at the age of 3. As assessed by the Childhood Autism Rating Scale (CARS; Schopler et al., 1980), John had a mild level of autism. John was receiving special education services as a student with autism. He was fully included in a kindergarten class and received speech and language services. Teachers reported that John followed classroom routines, but sometimes had difficulty with transitions. According to teacher report on the Social Skills Rating System (SSRS; Gresham and Elliot, 1990), he received a standard score of 96, indicating his social skills at the lower end of the average range. John could play simple games with prompting and answer social questions but did not initiated social interactions.

Gerard, was a 6-year, 4-month old Caucasian male diagnosed with autism and at a mild level according to the Childhood Autism Rating Scale (CARS). Gerard was fully included in a kindergarten *class* and received special education services. According to teacher report on the SSRS, he received a standard score of 81, indicating his social skills were delayed. As reported by his teachers, Gerard was able get most of his needs and wants met using his language. However, he preferred to play alone and rarely initiated any social interactions.

Kenny, was a 5-year, 6 months old African American male diagnosed with autism at a mild level according to CARS. Kenny was fully included in a preschool class and received special education services. According to teacher report on the SSRS, he received a standard score of 79 indicating his social skills were delayed. Kenny communicated mostly using phrases and simple sentences, although these communication intents were most often directed to adults. He preferred to play by himself and would only engage in social behaviors with prompting.

The six three typical peers, three males and three girls, were selected by their teachers. Two typical peers were grouped with each child with autism: one selected as a play partner during intervention sessions and the remaining one became play partner during play sessions for the generalization probes.

The Multimedia Social Stories

A set of multimedia social stories were developed for participant children according to Gray's outlines. The HyperCard software was used in order to create multimedia social stories. This program has a book like format which contains text of the social stories, movies of the social skills corresponding to the social story sentences; audio capability that read aloud sentences using a synthesized computer voice, and a navigational button clickable by the participants. Each multimedia social story included information specific to the session's play activity along with short movies corresponding to the social story sentence on each page. Following the development of a set of social stories, the researcher taught three participants the basic skills such as moving the mouse to move the cursor on the display and clicking the play button to start the movie for using the computer. The researcher, then introduced each participant to their multimedia social stories and allowed participants operate the multimedia social story each day immediately before the play session. At the end of the story reading, the researcher asked the target child four questions to assess his comprehension of the story. If the target child did not correctly answer a question, the peer was given an opportunity to provide the correct response. The experimenter would repeat the question and the correct response. If the target child did not provide the correct response, the researcher would model the correct response until the target child responded correctly.

Setting

This study was conducted at a school located in upstate New York. All training sessions took place in the play room. A Panasonic video camera set on a tripod was placed in the play room in order to videotape play sessions. The camera was positioned opposite the side of the table with the pile of games on it, in order to capture both the child and peer as they played. Videotapes of the play sessions were later scored by the researcher and a trained research assistant.

Dependent Measures

The three primary dependent social measures were, (1) appropriate social engagement with peer, (b) inappropriate social engagement with peer, and (c) the absence of engagement with peer. All baseline and experimental sessions were video taped. The video was then transferred to DVD format at the end of the each

data collection. The initial coding was done by the principal researcher after each session to assess student performance and guide the progression of the study. To assess interobserver agreement, a second observer coded thirty percent of all sessions, recording social engagement codes. The rater was trained by the investigator and scored practice videotapes until interrater reliability reached a level of .80. A second by second comparison method (Maclean, Tapp, & Johnson, 1985) was employed for assessing agreement for social engagement codes, and kappa coefficients ranged from for John .72 to.94 (M=.89), for Gerard .83 to .97 (M=.93), and for Kenny .85 to .99 (M=87).

Design

A multiple baseline design across participants was used to examine the effectiveness of the multimedia social stories on the social engagement of three children with autism. This design requires the intervention to be implemented in a staggered fashion across three different series so that each participant serves as a control for the other participants (Kazdin, 1982).

Procedure

The principal researcher observed the participant children across two weeks of school day and noted child activity preferences and materials that target children touched or manipulated. A list of preferred activities was generated for each of the following activity categories: Art/Pretend Play, Games, and Building Activities. Second, the researchers interviewed classroom teachers and obtained information about whether the intervention goal of increasing specific social skills matched the child's needs. Additionally, before the first day of intervention, the primary researcher met with each typical peer for three 15-min orientation sessions. The researcher overviewed the appropriate social interactions with peers and modeled each skill individually for peers and role played appropriate interactions with them.

Baseline and Intervention

Observations of the three participants and their training peers were conducted at the play room of the participants' school during regular school hours. During the baseline condition, the researcher brought each target child and his training peer to the play room and allowed the target child operate a multimedia generic story. After the first reading of the multimedia story, the researcher showed target child the comprehension questions and asked him his answers. Then the target child and typical peer were asked to play in the play area for 10 minutes.

Intervention data were collected three times per week for participant children. Each play session was 10 minutes in duration. In the beginning of each play session, a social story which described the day's activity was operated instead of a generic story. During one out of every five intervention sessions, ten-minute covert probes were performed to collect a sample of data immediately prior to the intervention session.

During the intervention sessions, the researcher introduced the multimedia social story first to John. When the researcher started intervention with John, two other participants remained in the baseline until John met criterion 1. Criterion 1 required that intervention data for appropriate social engagement indicated: (a) an increase in level, (b) an accelerated slop, (c) and increase in median and (d) no overlap with baseline data. When John met the Criterion 1, the researcher began intervention with Gerard. This process continued until all three participants started the intervention.

Maintenance

Two maintenance probes were conducted after the final intervention session. In order to decide when the intervention would be faded, a second criterion was established. According to Criterion 2, fading began after 15 intervention sessions and when four out of last six intervention points for appropriate social engagement were at least 40 percent greater than baseline for four of the last six data points. When a target child met with this criterion, then the multimedia social story operated every other session (Fade A). Operating the multimedia social story in every other session continued for 6 sessions. If the duration of appropriate social engagement remained at least 40% greater than baseline for four of the last five data points, no story was read to participant children. This no story condition (Fade B) continued for five sessions. For the generalization, each time a target child met the first Criterion or the second criterion, generalization probes were administrated. Target children were observed with a non training peer in the play room and in their regular classroom for 10-minute sessions.

RESULTS

Duration of Appropriate Social Engagement with Peers

Duration of appropriate social behaviors across baseline, intervention and follow-up phases for each participant are presented in Figure 1. According to the multiple baseline design, these data show increases in duration of

appropriate social engagement for all participant children following the initiation of the multimedia social story intervention.

During baseline, John spent a minimal amount of time with his peer, and directed most of his comments to the researcher. While the researcher refrained from interacting with John, John continued to seek adult attention. John's mean of appropriate social engagement with a peer during baseline was 43.67 seconds. Following the introduction of the intervention the duration of John's appropriate social engagement with a peer significantly increased. During intervention sessions, John's duration of appropriate social engagements ranged from 180 second in the third intervention session to 492 seconds in the fifteen intervention session with a mean of 301.46 seconds. When the intervention was conducted every other session for six sessions, John's duration for appropriate social engagement ranged from 412 seconds to 490 seconds and his mean duration increased to a mean of 467.17 seconds. When the intervention faded for the second time (Fade B), John's duration of appropriate social engagement again dropped slightly to a mean of 436.83 seconds. Data were collected for an additional six sessions with no intervention. John's mean duration dropped to 330.25 seconds during this No Story condition. Although there was a decrease on John's appropriate social engagement during Fade B and No story conditions, John continued to display an increase over baseline in his duration of appropriate social engagement. Following the introduction of the intervention the duration of Kenny's appropriate social engagement increased to a mean of 376.13 seconds. Intervention data indicated that there was an increase in the level of the data and accelerating trend was evident.

During baseline sessions, Gerard's mean duration appropriate social engagement was 81.17 seconds. With the introduction of the intervention, the duration of Gerard's appropriate social engagement significantly increased. Similar to John, there was an increase in the level of the data and accelerating trend was evident. During fifteen intervention sessions, Gerard's duration of appropriate social engagement ranged from 274 seconds in the first intervention session to 463 seconds in the twelve intervention session with a mean of 388 seconds. When the intervention was conducted every other session for six sessions Gerard's duration of social engagement increased to a mean of 419.83 seconds. During the Fade B condition, Gerard's appropriate social engagement decreased slightly to a mean of 374.83 seconds. Data were collected for an additional six sessions with no intervention. Gerard's mean duration dropped to 325.83 seconds with a range of 289 to 367 seconds. Although there was a decrease on Gerard's appropriate social engagement during Fade B and No story conditions, Gerard continued to display an increase over baseline in his duration of appropriate social engagement.

As shown in Figure 1, Gerard participated in ten play sessions with a novel peer. His duration of social engagement ranged from 81 seconds during baseline to 423 seconds during the fifth probe. Generalization data suggest that Gerard showed significant improvement over baseline performance in his kindergarten class after the introduction of the multimedia social story intervention. Gerard's duration of appropriate social engagement with peers also increased in his kindergarten classroom.

During baseline sessions Kenny primarily engaged with parallel play. Kenny's mean duration appropriate social engagement was 82.58 seconds. Following the introduction of the intervention the duration of Kenny's appropriate social engagement increased to a mean of 376.13 seconds. Intervention data indicated that there was an increase in the level of the data and accelerating trend was evident. When the intervention was conducted every other session for six sessions, Kenny's duration of appropriate social engagement ranged from 394 seconds to 451 seconds and his mean duration increased to a mean of 425.83 seconds. During Fade B condition, Kenny's duration of appropriate social engagement decreased slightly to a mean of 377.33 seconds. Data were collected for an additional six sessions with no intervention. Kenny's mean duration again dropped to 292.57 seconds with a range of 210 to 340 seconds. However, despite Kenny's slowly decreasing trend, Kenny's level of appropriate social engagement remained higher than during baseline observations.

As shown in Figure 1, Kenny participated in ten play sessions with a novel peer. His duration of social engagement ranged from 72.33 seconds during baseline to 328.33 seconds during the fifth probe. However, generalization data suggest that Kenny displayed little improvement over baseline performance in his preschool classroom.

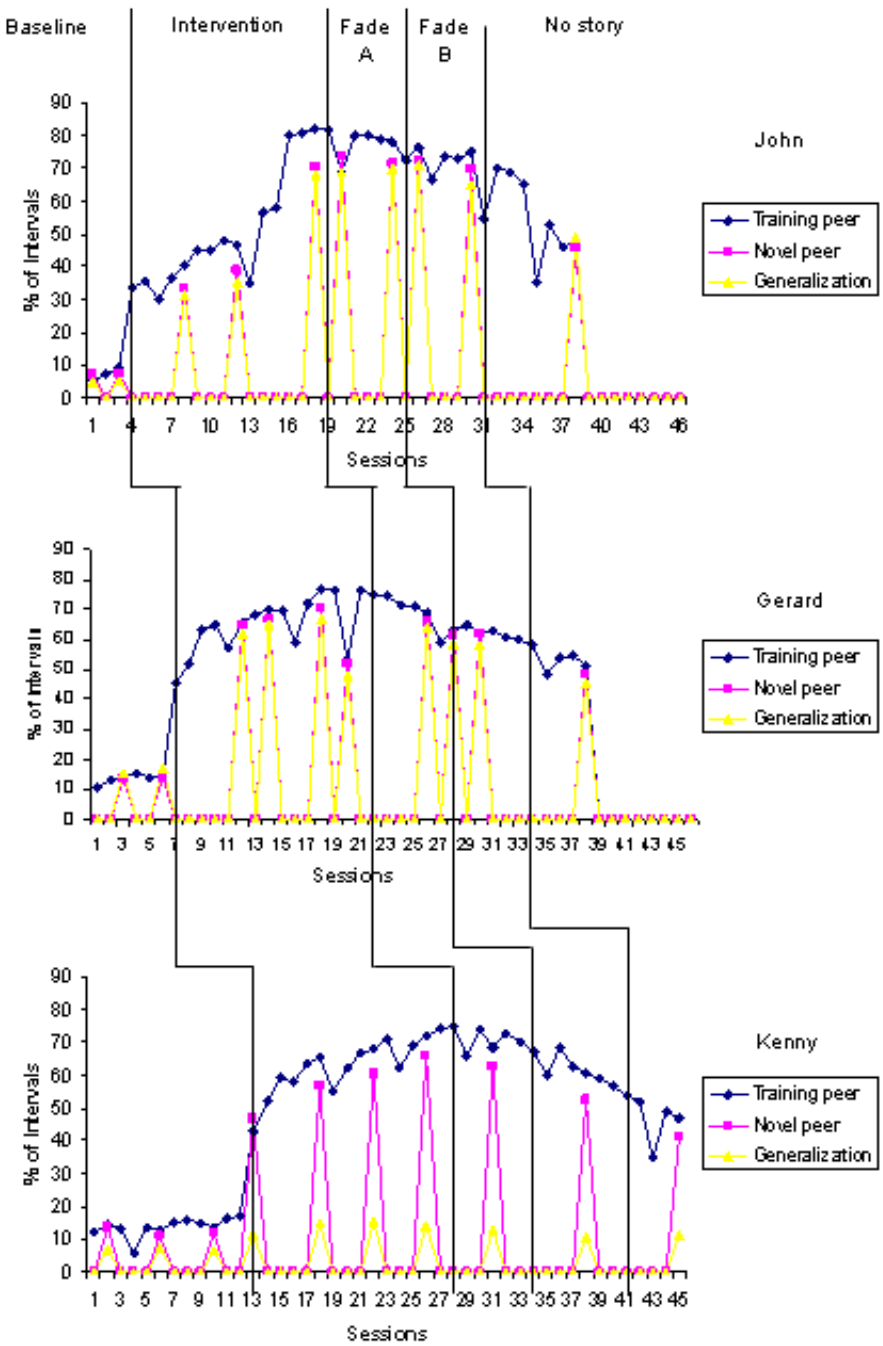

Figure 1. Percentage of appropriate social engagement with peers.

DISCUSSION

The present study evaluated the effects of multimedia social stories on the duration of appropriate social engagement of three children with autism. The study results showed that the multimedia social story interventions were effective in increasing the duration of appropriate social engagement of all children participated in this study. The social stories developed for the study were written according to the Gray's guidelines (1993). Following the implementation of the multimedia social story intervention, all target children demonstrated longer time spent socially engaged with peers compared to baseline performance. Treatment effects were generalized to the kindergarten classrooms by two of the three participants.

The effects of the multimedia social story intervention appeared to be most promising for John and Gerard across intervention and maintenance phases. Although all participants displayed a significant increase in the time spent socially engaged with peers, only John and Gerard generalized this improvement over classroom environments. During baseline sessions, John and Gerard appeared to barely acknowledge their play partners, and their play was imitative and lacked creativity and imagination. As the intervention progressed, both John

and Gerard appeared less static and more dynamic in the use social behaviors with play partners. In fact, an impressive change in the duration of appropriate social engagement was observed on the first day of the multimedia social story intervention and maintained themselves above baseline levels throughout the intervention and maintenance phases. Although marked improvements in Kenny's social interactions with his play partner and a novel peer in the intervention setting were observed, the same effects were not found in his preschool classroom. The reason for the lack of setting generalization would be the lack of similarity between the intervention setting and the actual classroom. Another reason would be that Kenny would have needed more amount of practice in order to generalize appropriate social engagement into his classroom.

The present study contributes in several ways to the effectiveness of social story literature. First, findings from this study demonstrate the potential benefits of using the multimedia social story intervention as the sole intervention to increase the duration of appropriate social engagement of children with autism. The results of this study were similar to those found previously for children with autism populations (Barry & Burley, 2004; Thiermann & Golstein, 2001). Second, this study added to the literature by looking at generalization and maintenance of the multimedia social story intervention, areas often over looked in previous research. Third, multiple-baseline experimental design was used in the present study. Many studies on the effectiveness of social stories have used nonexperimental designs that are plagued by threats to internal and external validity (Kuoch and Mirenda, 2003; Reynhout and Carter, 2006). Furthermore, the children in this study did not receive any type of reinforcement or behavior modification strategies while participating in play sessions. Removing strategies such as prompting techniques, token systems, and other reinforcement systems reduced the potential for confounds within the study. Therefore, one can conclude that the multimedia social story intervention was primarily responsible for the change in the duration of appropriate social engagement of children participated in the study.

In summary, the multimedia social stories effectively increased the duration of social engagement of three children who participated in this study. Generalization to a second setting was evident for two of the three participants. Maintenance of increased social interaction was noted for all three participants. Overall, results from this study contribute to the social story literature for improving the duration of appropriate social engagement of children with autism. The present study lends empirical support to the notion that children with autism, specifically young children with autism, can be taught and can learn appropriate social engagement.

Because of the rapid increase in the use of computers in educational environments, there are important opportunities for applications of the multimedia intervention conducted in this study (Hayes & Bybee, 1995). One of the most important applicability of using multimedia social story intervention is that once operating the multimedia social story intervention is learned by a child with autism, additional human resources are not needed to implement the intervention (Hagiwara & Myles, 1999).

Specifically, this study supports the need for continued research in the use of the multimedia social stories to increase social interaction of young children with autism. However, future research should try to build an empirical base for the various components of the multimedia social story intervention with children with autism. Further research would also benefit from comparing the amount of practice needed to generalize the social behaviors into the natural environment with typically developing children. In the current study, the length of the phases of the study makes it difficult to predict if the results would be maintained over time. It may have been useful to continue in the intervention phase for a longer period of time for Kenny in order to support the maintenance skills. It would be also interesting to compare the generalization of social behaviors between children who are initially exposed to a multimedia social story within a structured setting, versus those who are introduced to the multimedia social story within a natural setting. Future research may focus on introducing the multimedia social stories in a natural setting as well as in a structured setting and compare the result both.

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