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Using an iPad-presented social story to increase on-task behaviours of a young child with Autism

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Social stories have been widely used to help children with autism understand how to act in a particular situation. A single subject design was used to investigate the effectiveness of presenting a social story on an iPad to increase the on-task behaviours of a high functioning five-year-old girl with autism. The intervention was undertaken in a one-on-one situation within an autism-specific preparatory classroom. Analysis of video data collected over six weeks indicated that this intervention was successful in increasing the subject's rate of attention to teacher and materials. Improvements in affect around time-with-teacher were also noted. This study adds to the efficacy of using social stories with young children with autism. Additional research is warranted to explore the viability of the iPad as an intervention tool to promote early learning for young children with and without exceptionalities.

Introduction

Autism is a pervasive developmental disorder characterised by impairments in social interaction and communication, and by restricted and repetitive behaviours and interests (American Psychiatric Association, 2000). It is one of three recognised disorders in the autism spectrum; the other two being Asperger Syndrome and Pervasive Developmental Disorder. All disorders impact not only on learning and achievement from an early age but also on many aspects of everyday functioning at home, school, and in the community.

With the movement in education towards full inclusion for increasing numbers of students with autism, there is a growing need to find research-validated interventions that teachers can integrate into their classroom. One such intervention that has been used with this student population is social stories. Social stories are literally accurate, individualised stories which contain text and illustrations to support clarity and meaning (Gray, 2010). These stories describe social situations, provide relevant cues, and define appropriate responses (Gray & Garand, 1993). They are commonly used to help understand reality, communicate information, and give assistance on how to behave or act in particular situations (Dodd, 2005). For example, a social story can be used to present social concepts and rules related to participating in a game or how to undertake a difficult task such as initiating social interactions in the playground (Boutot & Myles, 2011). The goal of a social story is to share accurate social information in a patient and reassuring manner that is easily understood by the child.

Information and Communication Technology (ICT) is also of growing interest within

the area of education. Within the last decade, the Australian government has focused attention on how ICT can make teaching and learning more effective. Blackmore, Hardcastle, Bamblett, and Owens (2003) report that ICT is best used in the classroom when integrated into general teaching and learning and suggest a number of areas for improvement, including the integration of ICT into subject content and teaching practices and access to ICT for disadvantaged students. From these perspectives, ICT offers a potential avenue for the delivery of social stories for children with autism. For example, Litras, Moore, and Anderson (2010) combined video modelling with social stories to remedy social deficits faced by young children with autism.

This exploratory study investigated the effectiveness of presenting a social story on an iPad to increase the on-task behaviours of a high functioning five-year-old girl with autism. It was predicted that the iPad-presented social story would improve the child's attention during table-top activities with a teacher.

Method

Participant and setting

The participant (pseudonym Sarah) was aged 4 years 10 months and attended an early intervention centre for young children with autism spectrum disorder (referred to subsequently as "the centre"). The centre was operated by AEIOU Foundation, a state-wide service provider for children with autism (2 to 6 years of age) and their families throughout Queensland. Sarah was in the pre-preparatory classroom for 4-5 year olds with 13 other children, one teacher, four teaching assistants, and therapy support.

At the time of this study Sarah attended a 5-hour program 5 days a week at the centre. She had daily access to a speech therapist and occupational therapist through a transdisciplinary model of service provision. Sarah's expressive language was limited to labelling familiar objects and people. Her cognitive ability was reported by the teacher to be developing well. However, it was noted that she was easily distracted by environmental factors if her requests were not met immediately. Sarah had emergent reading skills and she required support with some fine motor activities such as scissor use.

The focus behaviour

The behaviour of focus (dependent measure) was identified as appropriate and typical classroom seated behaviour exhibited by a kindergarten or preparatory age child. The behaviour was defined as *attention to task, materials or teacher while seated*. In this study, a social story to prompt this attending behaviour was presented on an iPad to Sarah prior to her engaging in table-top activities with the teacher.

Research design

A single baseline A-B-A design was employed to assess the effectiveness of the intervention. This design builds upon the basic A-B design by adding a withdrawal of the intervention (the second A). This second baseline is referred to as the *verification phase* as a second return to baseline increases our confidence that the original predication made from the baseline was accurate (Riley-Tilman & Burns, 2009). The study therefore comprised three phases: baseline (pre-intervention); intervention via iPad presented social story; and withdrawal from intervention (post-intervention). The first two phases (i.e., baseline and intervention) were executed consecutively. However, the last phase – due to external

demands – occurred a week after the intervention was concluded.

Procedure

Prior to the commencement of this study and any data collection, approval was obtained from AEIOU Foundation, Sarah's family, and Human Ethics in Research at Griffith University. All data collection sessions were conducted in the corner of the classroom and at a kidney shaped table where Sarah faced the other children in the class who were engaged at other learning centres. All sessions were conducted by the first author and were approximately 7 minutes in duration. Eighteen sessions were conducted across a 4 week period (baseline and intervention) and then 3 additional sessions (withdrawal of intervention) in the 6th week of the study. All sessions took place in the morning (9:30 - 10:30) and activities typically included puzzles, colouring in, building, cutting and pasting, and threading. Preparation for the session involved setting up the teaching space at a table and setting up the Flip Video on a tripod for digital video recording of the session. During the intervention phase, an additional 2 ½ minutes was required to present the social story via an iPad to Sarah prior to engaging her in the scheduled table-top activities.

Inter-observer reliability

The first and second authors coded and scored all session recording. In addition, members of the research team independently scored 20% of the sessions across all phases. The point-by-point agreement for this study was 90%.

Materials

iPad

An Apple iPad tablet was used to deliver a social story using an autism specific application designed for teaching social messages and learning purposes. A personalised social story was developed using the Stories2Learn application which incorporated photographs of Sarah and the first author in the classroom, the social story text, and a corresponding audio message that was provided by the first author.

Social story

The social story was generated according to criteria recommended by Gray (2010) and adhered to the social story formula. Initial information about the participant's behaviour during tabletop activities was gathered through direct observations and interviews with teaching staff in efforts to assess a baseline of the specific behaviour (Howley & Arnold, 2005). This data was used to identify the specific topic and text for developing the social story. Table 1 presents the text used in the social story, together with sentence type according to Gray (2010).

Table 1 Sentence Types used in Sarah's Social Story according to Gray's Guidelines (2010)

Text	Sentence Type
My name is Sarah.	Descriptive
At the learning centre Julie is here to help me.	Descriptive
When I'm at the table I will sit on my chair with my feet on the floor.	Coaching
Sitting like this helps me learn.	Descriptive
Sometimes when I learn new things I want to shout.	Perspective
I will use my quiet voice in learning centres.	Descriptive
This will help me listen to what I have to do.	Descriptive
When I'm learning I will keep everything on the table in front of me.	Coaching
It is important to keep everything on the table.	Affirmative
This helps me learn.	Descriptive
I learn when I sit on my chair, use my quiet voice, and keep everything on the table.	Coaching

The iPad was used to photograph Sarah in a variety of scenarios that represented the targeted behaviour and focus for the social story. The social story, photographs and audio commentary were loaded onto the Stories2Learn application by the first author. Each screen shot on the application depicted one sentence incorporating both written text and audio message, together with a corresponding photograph to match its meaning (see Figure 1). To access the story, Sarah needed to tap on the photograph of each screen shot to listen to a sentence. To advance to the next sentence and screen shot, Sarah needed to tap the arrow on the right side of the screen. At the conclusion of the social story the screen shot identified that the social story had ended.

Figure 1 Screenshot from iPad of 3rd sentence in Sarah's social story.

Results and Analysis

The data for the target behaviours was graphed, visually inspected, and then numerically analysed. First, the data for the target behaviour was plotted and is further displayed in Figure 2. Figure 2 displays the frequency of the target behaviour, expressed in terms of the

number of 10 second periods Sarah was on-task over the five minute observational period. Thus, the ceiling number of on-task behaviours was 30 for each session.

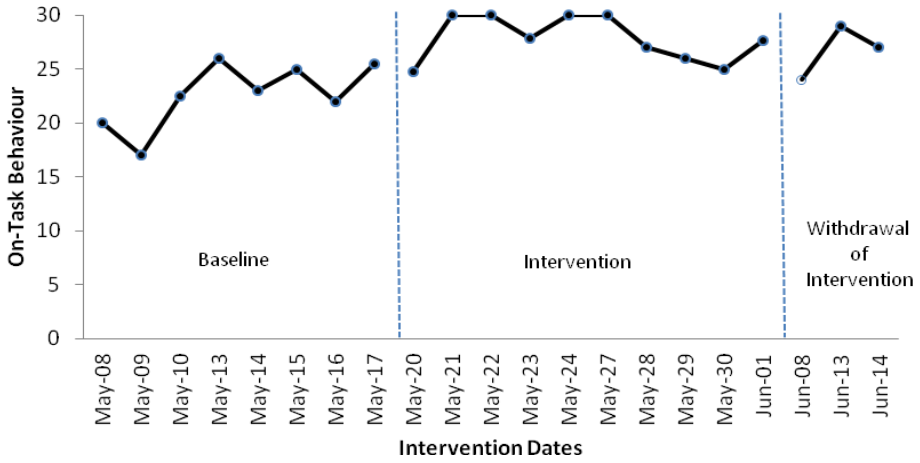

Figure 2 Frequency of on-task behaviour during baseline, intervention and verification.

Second, the data for the target behaviour was visually inspected to determine if a functional relationship existed between the delivery of a social story via an iPad and any observed behaviour change. Based upon a visual inspection of the data, Sarah appeared to make gains in the frequency of her on-task behaviours during the intervention phase of the study.

Because single case design relies heavily upon the visual inspection of data for interpretations of results (Riley-Tilman & Burns, 2009), the data collected was also explored from a variety of approaches (viz., change in trend, variability, and change of Median level). Table 2 presents the analysis using these approaches. A comparison of graphed data between the baseline and intervention phases indicates a movement of observed behaviour towards a more stable trend, reduced variability in attending, and an increased level of attending. Although it is difficult to draw conclusions from a comparison of graphed data between intervention and withdrawal of intervention phases due to the limited number of data points in the later phase, there appeared to be maintenance of level of attending. That is, gains made in attending during intervention using the social story were maintained for at least a week following the withdrawal of the intervention.

Table 2 Analysis of Sarah's Graphed Data across Phases

Phase	Analysis
Baseline	• Stable, slightly upward trend • Relatively large variability (value of 9) • Median* level 22.75
Intervention	• Stable trend (close to zero) • Smaller variability (value of 5.2) • Median level 27.75
Withdrawal of Intervention	• Upward trend • Smaller variability (value of 5) • Median level 27

*Median – as opposed to Mean – was selected here due to the limited number of data points (particularly in the verification phase) and the potential impact of extremes in the data set.

In addition, we looked at data overlap between the baseline and intervention phases in order to obtain an indication of effect size. For this calculation, the most extreme baseline data point (i.e., the value of 26) was compared to the number of intervention data points that are above this line divided by the total number of data points within the intervention phase. This result offered a percentage of nonoverlap. In this case, there was 70% non-overlapping data. Scruggs and Mastropieri (1998) suggest at least 80% for a large effect size; thus, the result was what Cohen (1988) would classify as a medium effect. Taken together, visual analysis and interpretation of the graphed data lent support to the intervention being successful at increasing Sarah's attending or on-task behaviours during tabletop activities within her classroom environment.

Discussion

This study was exploratory in nature and investigated the effects of presenting a social story on an iPad to increase the on-task behaviour of a young child with autism. As hypothesised, the result revealed the intervention was successful in increasing Sarah's rate of attention to teacher and materials. The observed increased level of attending (as shown by the change in Median level between baseline and intervention phases), together with the finding of effect size, supported the effectiveness of the intervention in this study.

The combination of the social story together with the iPad proved to be an effective intervention with a girl not quite 5 years of age. The result confirms previous findings that social stories can be effective with children with autism during the early years of learning (see Crozier & Tincani, 2007; Gray & Garand, 1993; Ivey, Heflin, & Alberto, 2004; Kuoch & Mirenda, 2003; Litras, Moore, & Anderson, 2010). Moreover, the result aligns with previous findings that social stories, combined with ICT, are beneficial, and increase the learning of individuals with autism (Hagiwara & Smith Myles, 1999; More, 2008; Sansosti & Powell-Smith, 2008).

This positive result from using an iPad-presented social story to increase attending

behaviours may be attributed to the enhanced meaning Sarah gained from the visual representation of information on the iPad together with the motivational aspects of ICT. This technology has been associated with increased student motivation, attention, reinforcement, and self-direction (Chen & McGrath, 2003; Davies, Stock, & Wehmeyer, 2004; Laffey, Espinosa, Moore, & Lodree, 2003). In addition, ICT has been found to offer individuals with autism a non-threatening, protected, and dependable environment (Keay-Bright & Howarth, 2011; Konstantinidis et al., 2009; Wall, 2004). All these benefits were brought together in the iPad-presented social story for Sarah.

The data collected during the study did not allow judgements to be made about the extent to which either the iPad or the social story contributed to the change in Sarah's behaviour. However, the combined effects of the iPad and social story have a number of practical implications for teachers working with children with autism. Sarah responded well to the audio-visual media and easily navigated the application using the touch screen display. The Stories2Learn application was cost effective and easy to use. The built-in tools provided a structure in which the personalised social story was easily created using photographs, text, and audio messages. The portable nature of the iPad allowed the teacher to collect the necessary photographic data to construct the social story in the actual setting.

Limitations

Although this study contributes to existing data on social stories and provides initial evidence for using iPads with young children, several limitations should be noted. First, findings are based on a sample of one. Further research needs to be undertaken to investigate the effects of iPad-presented social stories with children of varying ages, abilities, and learning styles, with and without autism. Second, this study was conducted under the restricted time conditions of 21 brief sessions at the same time in the morning program. Similar research needs to be conducted for longer periods and at different times of the day. Third, intervention focussed only on table-top learning by an individual within the classroom. Additional research into iPad-presented social stories needs to be conducted in other curriculum areas and in a variety of group situations within and outside the classroom. Fourth, the social story was aimed only to increase attending behaviour. There is an urgent need to expand the research across a range of prosocial behaviours.

Conclusion

This study adds to the efficacy of using social stories with young children with autism. It also provides insight into the viability of the iPad as an intervention tool. At this point in time, the integration of the iPad into learning and teaching is in its infancy. Because of the rapid uptake of these devices in schools, there is an urgent need to know more about the iPad as an educational tool and the ways it can be used by teachers to promote the learning of all students in Australian classrooms.

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