ESTABLISHING THE RELATIVE IMPORTANCE OF APPLYING GRAY'S SENTENCE RATIO AS A COMPONENT IN A 10-STEP SOCIAL STORIES INTERVENTION MODEL FOR STUDENTS WITH ASD

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Literature on Social Stories cautions that there is little empirical evidence for their effectiveness. Researchers have called for further investigations to determine the components of Social Stories intervention packages that contribute to their efficacy. Gray has introduced a ratio of sentence types to be used in Social Stories. The present study seeks to investigate if Gray's recommended sentence ratio is an essential component of Social Stories. For this purpose, a 10-Step Social Stories intervention model using Gray's sentence ratio (i.e., a 'contextual' Social Story), and one omitting Gray's sentence ratio (i.e., a 'directive' Social Story), was compared in teaching social skills to students with ASD. Contextual Social Stories consistently yielded fewer trials to criterion and maintained stable performance at criterion.

Introduction

Social Stories as an Instructional Strategy for Autism Spectrum Disorders

Social skills deficits represent an essential part of the diagnostic picture of autism spectrum disorders (ASD) or pervasive developmental disorders (PDD) in the DSM-lV-R (Diagnostic and statistical manual of mental disorders by the American Psychiatric Association, text revision 1996). The majority of individuals with autism have either a limited interest in reciprocal social interactions, or they may have an interest in interacting with others but lack the necessary skills to do so effectively (Szatmari, Bartolucci, Bremner, Bond, & Rich, 1989). Social skills are among the most complex, but also the most important, behaviors to learn because they have a great impact on an individual's social engagement and quality of life; thus, social skills training constitutes an important aspect of working with individuals with ASD/PDD (Neisworth & Wolfe, 2005; Chadsey-Rusch, 1992). One particular instructional tool for teaching social skills to students with autism is an intervention called Social Stories.

A Social Story is a short story, defined by specific characteristics, that describes a situation, concept, or social skill using a format that is meaningful for individuals with ASD (Reynhout & Carter, 2006). Originally, Social Stories were developed by Gray (1995) to teach children with autism how to play recreational games while increasing their ability to interact socially with others (Quill, 1995). They have been used with a focus on diverse social skills in the instruction of children with varying degrees of severity of ASD (Barry & Burlew, 2004; Reynhout & Carter, 2006). Gray and White (2002) have published a book with many sample Social Stories for practitioners that covers various topics including self-care, playing at home and going places; however, these samples do not include empirical information on implementation of such Social Stories. Reviewers of Social Story literature (Barry & Burlew, 2004; Reynhout & Carter, 2006; Sansosti, Powell-Smith, & Kincaid, 2004; Tarnai, Wolfe, Rusch, & Lee, 2009) identified about 30 published studies in which Social Stories have been implemented and have reported that behavioral targets included both aims to decrease socially disruptive or challenging behaviors (e.g., using loud voice, dropping to floor for tantrum, spilling food/drink) and to increase social interaction or communicative behaviors (e.g., napkin use, sharing toys, greeting).

Gray (1995) emphasized that Social Stories are intended to describe more than direct behavior, thus, Social Stories are differentiated from instructional techniques such as task analyses. To ensure a descriptive framework, Gray introduced a ratio of specific sentence types (Table 1) to be used in a Social Story (i.e., two to five descriptive, perspective, and/or affirmative sentences for every directive and/or

control sentence). Reviews of the literature (Barry & Burlew, 2004; Reynhout & Carter, 2006; Sansosti et al., 2004; Tarnai et al., 2009) have revealed that Social Story implementations do not systematically adhere to Gray's sentence ratio.

Table 1. Basic Sentence Types Used in Social Stories

Sentence Type	Definition[a]	Example
Descriptive	Describes the social situation in terms of relevant social cues.	In the morning, when it is time for me to get up and get dressed, Mom or Dad lays out clothes for me onto the bench at the end of my bed.
Directive	Describes an appropriate behavioral response.	When I get up and out of bed, I have to take off my pajamas and put on the clothes that my Mom or Dad laid out for me.
Perspective	Describes the feelings and/or responses of the student OR others in the situation.	If I get dressed properly and in time, my parents will not be nervous and worried that I may be late for catching the school bus.
Affirmative	Expresses a commonly shared value or opinion within a given culture.	Because parents are busy in the morning with preparing breakfast for the family and getting ready for going to work, it is nice to help them by getting dressed independently and save time for them to finish their jobs.
Control	Written by a person with ASD to identify personal strategies to recall and use.	When I see Mom or Dad in the morning laying out clothes on the bench at the end of my bed for me to wear, I will get out of bed, take off my pajamas and put on those clothes.
Cooperative	Describes what others will do to assist the student.	If I need help with buttons or zippers, I can tell Mom or Dad "please help me", show what I could not do on my own and they will help me do it.

Note. [a]Definitions are based on the literature review by Reynhout and Carter (2006).

Reynhout and Carter's review of the literature (2006) points out that Gray's (1995; 2003) recommendations for story construction were not based on empirical evidence. Reynhout and Carter (2006) conclude that because of a high degree of procedural variation among their reviewed studies, and additional issues of treatment fidelity, no sufficient experimental control was established to ascertain solid empirically based findings related to the efficacy of Social Stories; incl. variations of Gray's sentence ratio. Although studies reviewed by Tarnai et al. (2009) have reported some positive outcomes (e.g., Bledose, Myles, & Simpson, 2003; Brownell, 2002; Hagiwara & Myles, 1999; Kuoch & Mirenda, 2003; Kuttler, Myles, & Carlson, 1998; Lorimer, Simpson, Myles, & Ganz, 2002; Scattone, Wilczynski, Edwards, & Rabian, 2002; Scattone, Tingstrom, & Wilczynski 2006; Swaggart, Gagnon, Bock, Earles, Quinn, Myles, & Simpson, 1995), such positive outcomes were not linked to certain procedural variations in Social Stories. As Tarnai et al. (2009) note, because component variables were not systematically manipulated across replicated interventions, effective components were not isolated, hence, not distinguishable.

Thus, the central issue identified by reviewers of Social Story interventions (Barry & Burlew, 2004; Reynhout & Carter, 2006; Tarnai et al., 2009) is the lack of a consistent research base that would make Social Story interventions comparable along the components of intervention packages. At present, because so many Social Story components are varied at the same time, a comparative component analysis is not possible and the relative necessity of individual intervention components cannot be established. However, a component analysis would be desirable to establish an empirical basis for Social Stories and to guide practitioners in implementing Social Stories in the most efficient manner. Without a component analysis, it is not possible to ascertain whether Gray's (1995; 2003) specific

recommendations for constructing Social Stories (i.e., her sentence ratio) are necessary or whether other instructional components can achieve the same effect (with a possibly less complicated intervention, since applying Gray's sentence ratio for constructing a text requires careful adherence to specific guidelines). An answer to this question is needed because for over a decade, Social Stories have been, and continue to be, applied (Barry & Burlew, 2004; Reynhout & Carter, 2006) without a common framework and without empirical evidence of their relative efficacy in practical implementation.

Quirmbach, Lincoln, Feinberg-Gizzo, Ingersoll, and Andrews (2009) compared two formats of a social story to a control condition, using a pretest posttest repeated measures randomized control group design with 45 children diagnosed with ASD. The standard and directive stories were equally effective (over the control condition) in eliciting improvements in game play, and the children in the standard and directive groups continued to demonstrate appropriate game play skills across trials, and maintained their skills one week after receiving the intervention. Here, the 'standard' story included the same directive sentences as the 'directive' format. Thus, as the authors observe, their study provided strong empirical evidence mainly for the efficiency of social stories as such, yet it did not represent a thorough component analysis.

A partial component analysis was attempted by Okada, Ohtake, and Yanagihara (2008), investigating the impact of manipulating the value of perspective sentences. Three types of perspective sentences (sentences held by unknown persons, those held by familiar persons, and those held by the most preferred person) were alternately added to a Social Story to determine which perspective sentences were the most effective in improving the student's head and elbow positions during sitting at morning circle and lunch. Results indicated that the effectiveness of a Social Story did not seem to depend on whose perspectives the story used. Findings suggest that depicting only the perspectives of the most preferred person in the story may not be sufficiently powerful to change behaviours. These findings support Gray's intuitive position on the need for adding broader social-contextual information to directive training but still do not provide for detailed component analysis of social stories.

In response to the lack of a component analysis, Tarnai et al., (2009) reviewed and analyzed Social Stories interventions for individuals with ASD to identify typically reported elements of intervention packages, in order to establish an empirical basis for comparison, so that systematic experimental manipulations could be introduced. Based on the review, a 10-step model Social Stories intervention package (Table 2) was developed and implemented in a pilot study to test whether the isolated core components constituted an effective Social Story intervention. Procedural fidelity was established, and the Social Story implementations resulted in attainment of behavioral goals by six individuals with ASD. These goals included reducing inappropriate social behaviors such as hitting for attention, stigmatizing vocalizations, indecent scratching or self-exposure in public; and increasing social interaction and initiation within an applied social skills training setting.

Purpose of the Present Study
The present study builds on the framework of the 10-step approach from the Tarnai et al. (2009) study that established a basis of comparison for systematic modifications within a Social Stories intervention package. Specifically, the study examines if Gray's sentence ratio is an essential component of Social Stories interventions to attain positive outcomes on social skills for individuals with ASD. For this purpose, a 10-Step Social Stories intervention model including Gray's sentence ratio (i.e., a 'contextual' Social Story), and a similarly composed model omitting Gray's sentence ratio (i.e., a 'directive' Social Story), is compared in teaching social skills to students with ASD. Other intervention components (Tarnai et al., 2009) will be kept constant.

Research questions include: (a) Is there a difference between a contextual Social Story intervention package including Gray's sentence ratio, and a directive Social Story intervention omitting Gray's sentence ratio, for teaching table setting for friends to students with ASD, on performance measured by percentage of criterion attained (based on pre-defined task analysis steps)?; and (b) Is there a difference between a contextual Social Story intervention package including Gray's sentence ratio, and a directive Social Story intervention omitting Gray's sentence ratio, teaching table setting for friends to students with ASD, on performance measured by number of necessary trials to criterion?

In addition to these primary dependent measures, (c) an ancillary measure to assess response generalization is also included. Specifically, the placement of an additional utensil (i.e., napkin) not

included in the Social Stories for table setting will be recorded during baseline and intervention; to explore the possibility of generalization-across-behaviors of the social-contextual message of the contextual Social Story version (i.e., adhering to Gray's sentence ratio) that emphasizes the advantages of the predictability of a certain place setting.

Table 2. Tarnai's 10-Step Approach to Constructing and Evaluating Social Stories
(Based on Tarnai et al., 2009.)

Task Steps	Strategies	Outcomes	Evaluation[a]
1) Identify behavior in need of change	Improvements in this behavior should likely lead to increased functional/adaptive behaviors, social functioning, or safety.	Behavior pinpointed and defined	....
2) Identify target social skill for instruction	The social skill (alternative behavior) chosen for instruction should increase social competence (i.e., skill is functional for the student).	Target skill (alternative behavior) defined	....
3) Collect baseline data	Observe and record the occurrence of targeted non-desirable behavior(s) and/or desired (alternative) behavior(s).	Recorded and graphed baseline data	....
4) Create Social Story	The teacher[b] writes the Social Story: *a)* in the first ("I") and/or third person ("he/she/they"); *b)* in present or future tense; *c)* at the comprehension level of the student – use as much student input as possible (check comprehension after initial reading); *d)* label the Social Story with a title that quickly relates to the topic; *e)* give the story an introduction, body, and conclusion; *f)* state behaviors positively ("do" vs. "don't"); and *g)* use Gray's sentence ratio.	Personalized and formatted (*a–g*) Social Story ready for implementation with the student (comprehension demonstrated)	....
5) Select additional visual cues and materials	a) Select visual cues (e.g., photos, drawings, icons, graphic/bulleted schedules); b) set the fading schedule and use cues accordingly.	Visual cues / schedule of use identified	....
6) Rehearse Social Story linked to practice of the target social skill	The Social Story should be read prior to the actual situation in which the target social skill will be used. Skill practice scenarios (settings and contingencies) should be linked to the Social Story.	Accurate story readings and skill rehearsal contingencies	....
7) Collect performance data	Observe and record/graph performance of the desired target behavior, after the introduction of the Social Story.	Recorded and graphed intervention data	....
8) Adapt Social Story implementation procedures, if necessary	According to changes in the targeted behavior shown by the performance data, changes in the Social Story implementation procedure (e.g., story structure or rehearsal format; skill practice scenarios) may be necessary to ensure ideal performance.	Reviewed and adapted procedures (story/ routines) in place; skill is demonstrated	....
9) Promote generalization	If stable social skill performance reaches the expected criteria in the trained practice situation, establish at least two new settings (general case programming) where the same target skill would be helpful. Adapt procedures and monitor performance.	Reviewed and adapted procedures in place; generalized target skill performance	....
10) Fade Social Story	Gradually and systematically fade out the Social Story (e.g., less frequent readings, gradual reduction of the story length, switching to visual cues like graphic/bulleted schedules as reminders, etc.).	Reviewed and adapted procedures in place; skill is maintained	....

Note. [a] This 10-Step overview form may be used to check out steps and to add comments for the evaluation of the implementation of a particular Social Story program. [b] Or another professional who will be working with the student (e.g., a teacher's aid, or a parent).

Method

Participants/Settings

The study was carried out in collaboration with the 'Agency Program' (name altered) of a human service agency in Pennsylvania. The Agency Program is a social skills training program serving approximately 15-20 school-age children per session (age range: 9-13 years) diagnosed with ASD. In the summer, when the study was conducted, the program met four to five times a week for six hours a day. The program included diverse structured and guided activities under the supervision of certified staff.

Participants for the study were selected from the pool of students with ASD attending the Agency Program summer sessions who displayed sufficient language/literacy skills to meaningfully read a personalized Social Story and to successfully answer related comprehension questions. Comprehension checks confirmed the match between participants' and their story's reading level, so no expectations of a reading level were pre-established beyond minimal, second-grade ability to read a continuous text, and to answer related comprehension questions with 100% accuracy (explained in detail below, under Implementation).

Identification and Training of Project Staff / Informed Consent

Three staff members of the Agency Program were identified by the program coordinator to participate in the study. The program coordinator and two additional staff members (all holding Master's degrees in education or psychology), all of them familiar to the children in the Agency Program, read the personalized Social Stories with the six participating students. The principal investigator provided staff training in a small-group format prior to the intervention, introducing the procedures of treatment implementation (i.e., Social Story readings), skill practice routines (i.e., table setting for group snack time), and observation/scoring. The principal investigator also conducted treatment fidelity checks to assure consistency in the implementation (see Reliability/Fidelity below for criteria). Agency staff sent out information and recruitment materials to the parents of children with ASD. Informed consent for participation was obtained in writing from the parents of six potential participants.

Pre-Implementation Procedures

Assessment of potential participants.

Based on parental/staff report and direct observation during baseline performance, participants' hearing and vision was in the normal range. All participants were able to read (and routinely participated in chronological-age matched grade-level, inclusive classes with peers without disabilities) and used verbal speech for communication. After informed consent was obtained, potential participants were given two formal assessments to determine their eligibility to participate in the study, one instrument related to reading level, and a second instrument related to communication skills: (1) DIBELS reading fluency probes; and (2) the Communication Matrix^{TM} (Rowland, 2004).

As discussed, Social Stories can and should be individualized (Gray, 1995; 2003) for each student's reading and intellectual skills. Thus, participation criteria for literacy were based and assessed on a minimum, second grade oral reading fluency benchmark for a continuous text for our assessment instrument (1): DIBELS reading fluency probes were created, conducted, and scored according to DIBELS guidelines (Good & Kaminski, 2007). All six potential participants passed the benchmark; and they typically read well at their actual grade level (all attended some inclusive classes; Table 3).

As appropriate reading abilities were the only critical and functional participation skills in the Social Stories intervention, no other (intellectual) characteristics were assessed. Yet, it needs to be stressed that all participants routinely participated in chronological-age matched grade-level, inclusive classes (Table 3); i.e., their academic/intellectual abilities may be expected to be within an average, chronological-age-appropriate range.

For our assessment instrument (2): a communications skills profile was completed using the Communication Matrix^{TM} (Rowland, 2004) that assesses communication abilities via parent/professional interview. The program coordinator of the Agency Program provided the data for completing the profiles of the potential participants. All six participants have scored on Level Vll (i.e., language: rule-bound use of symbol system, ordered combinations of two or more symbols according to syntactic conventions; Table 3). Thus, potential participants have demonstrated functional oral communication abilities (as opposed to alternative means of expression). The data provider (the program coordinator of the Agency Program) has observed that although all six participants had the ability to use language (standard

American English) for communication in all tested areas, they typically (as expected with ASD) did not often initiate, or engage in, extensive oral communication in Agency Program sessions as much as they abilities would allow.

Because potential participants were assessed as having adequate reading and verbal communication skills, all six boys were included in the study (no females participated in the Agency Program sessions in the given summer). Information was obtained on age, literacy and communication skills, diagnosis, and school placement of the participants (Table 3).

Table 3. Overview of Participants' Demographics, and Assessment Scores Prior to Social Story Implementations

Student	Age[a]	Diagnosis	School Type	DIBELS Oral Reading Fluency[b]	Communication Matrix Profile[c]
Matthew	10y	Autism	Attends general education classes at a public elementary school (has completed 4th grade)	ORF beyond 100 words per minute (ORF=90 signals low risk at the second grade end-of-year level)	All six participants have scored Level VII (Language: Rule-bound use of symbol system. Ordered combinations of two or more symbols according to syntactic conventions.) and thus have demonstrated oral communication abilities (as opposed to alternative means of expression) in all four main categories of refuse, obtain, social, and information; and within all sub-categories.
Jonathan	11y	Autism	Attends general education classes at a public elementary school (has completed 5th grade)	ORF beyond 120 words per minute (ORF=90 signals low risk at the second grade end-of-year level)	
Chris	10y	PDD-NOS	Attends general education classes at a parochial elementary school (has completed 4th grade)	ORF beyond 90 words per minute (ORF=90 signals low risk at the second grade end-of-year level)	
Grant	9y	PDD-NOS	Partially attends inclusive classes at public school (has completed 3rd grade)	ORF beyond 90 words per minute (ORF=90 signals low risk at the second grade end-of-year level)	The scorer (the program coordinator of the Agency Program) has observed that although all six participants had the ability to use language (standard American English) for communication in all tested areas, they typically (as for ASD) did not often initiate, or engage in, extensive oral communication as much as they abilities would allow.
Jimmy	10y	PDD-NOS	Attends general education classes at a public elementary school (has completed 4th grade)	ORF beyond 110 words per minute (ORF=90 signals low risk at the second grade end-of-year level)	
Bruce	11y	PDD-NOS	Attends general education classes at a public elementary school (has completed 5th grade)	ORF beyond 120 words per minute (ORF=90 signals low risk at the second grade end-of-year level)	

Note. [a]y=years. [b]Assessment materials and risk evaluation based on DIBELS Benchmark Goals and Indicators of Risk; retrieved June 23, 2008, from http://www.dibels/uoregon.edu. [c]Rowland, Ch. (2004). *The communication matrix: A communication skill assessment* (3rd ed.). Portland, OR: Oregon Health Sciences University. PDD-NOS=pervasive developmental disorder, not otherwise specified.

Identification of dependent measures.
Each participant was taught the skill of formal table setting for their Agency Program peers at snack time either via a contextual or a directive Social Story. For the current study, table courtesies applicable at group snack times were suggested by Agency Program staff because individual servers/other assigned jobs were a routine part of Agency Program sessions (e.g., distributing cups or napkins to peers, wiping shared tables clean). Table setting was selected, defined (setting format based on professional culinary service recommendations by Ridges & Curtis, 2004), and broken down into discrete steps through a task analysis (Appendix A) in collaboration with Agency Program staff.

Student performance was measured on: (a) criterion level (criterion = 100% of the task-analyzed skill steps [Appendix A] performed appropriately); and (b) the number of trials-to-criterion (reaching a consistent/continuous performance of 100% of the task-analyzed skill steps). In addition to these primary dependent measures, (c) the placement of the napkin in the table setting task, even though not included in the Social Stories (Appendix A; B; C), was recorded for all six participants during baseline and intervention. This ancillary dependent measure was added to explore the possibility of response generalization linked to the social-contextual message of the contextual Social Story version about predictability of the place setting: *Is there a reason why this place setting came to be a tradition? If people do things, like setting the table, in a similar way all the time, everybody will learn how this is done. People would find the same set-up when they go to a restaurant or to a friend's house. This way, people will not be surprised, and they will easily find everything they need at the table, right where they learned it should be* (quoted from the contextual Social Story; Appendix C).

In the present study, participants were handed napkins along with the other utensils mentioned in their Social Stories (i.e., plates, cups, forks, knives, and spoons; Appendix A; B; C). Any questions raised by the participants about the placement of the napkin were recorded and were answered with the pre-coded response by staff: *Do as you think it would be best*.

Definition of independent measures.
To test the efficacy of Gray's sentence ratio, two versions of the table setting task were developed: a contextual (i.e., including Gray's sentence ratio; step #4g in Table 2) and a directive (i.e., omitting Gray's sentence ratio) Social Story text. Thus, the independent measure in the study was instruction in table setting using either a contextual (i.e., including Gray's sentence ratio) or a directive (i.e., omitting Gray's sentence ratio) Social Stories intervention package designed according to the Tarnai et al. (2009) 10-step approach (Table 2). The intervention consisted of Agency Program staff reading aloud the participants' Social Stories with them (in individual staff-student pairs) one time at the beginning of each Agency Program session, with as much active student reading as possible. Comprehension questions were answered after initial reading (100% mastery expected, otherwise the stories would be modified as needed; see in detail below under Implementation).

Because independent performance was expected from the participants during the snack time routine, removed in time from the training (i.e., reading of Social Stories at the beginning of each Agency Program session), even though task-analyzed steps guided both the construction of Social Stories and performance scoring, no prompt hierarchy (e.g., independent performance / verbal / model / physical guidance) was applied during skill practice as would routinely be done in task analysis-guided training (Alberto & Troutman, 2008). In fact, one possible practical advantage of Social Stories in some instructional situations may be that instruction is 'removed' from skill practice in the actual settings and from actual expected performance times; thus, the intervention becomes relatively unobtrusive (see social validity ratings; Table 4) and requires low guidance/supervision from the instructor at actual performance times (Scott et al., 2000).

Social Story construction.
The principal investigator and Agency Program staff conducted an ecological inventory and developed task-analyzed steps for the target behavior of table setting for group snack time. Appendix A presents the task analysis of the performance steps that were embedded in the Social Stories. Based on these skills-steps, personalized Social Stories were developed, according to student reading levels; in both the contextual and directive versions (differing only on Gray's sentence ratio). Adhering to the Tarnai et al. (2009) 10-step approach (Step #4; Table 2), the principal investigator in collaboration with the Agency Program coordinator wrote the basic Social Story text: a) in the first (*I*) and third person (*he/she/they*); b) in present and future tense; c) at the comprehension level of the participants (comprehension check questions were prepared for initial reading); d) with a title that quickly related to the topic (i.e., How do I set the table for my friends at Agency Program at snack time?); e) formatted and given an introduction, body, and conclusion; f) with behaviors stated positively (*do* vs. *don't*); and g) with Gray's sentence ratio – in the contextual Social Story version. Appendix B presents the basic directive Social Story, and Appendix C presents the basic contextual Social Story.

The contextual Social Story constructed for the intervention (Appendix C) intended to maintain Gray's (1995; 2003) sentence ratio of two to five descriptive, perspective and/or affirmative sentences for every directive and/or control sentence (Table 1). Thus, the adherence to Gray's sentence ratio (step #4g; Table 2) was only checked for procedural fidelity for the construction of the contextual Social Story. The principal investigator and an expert in communication sciences and disorders independently coded the sentences of the basic story to identify them as either type 1 (descriptive, perspective and/or affirmative sentences) or type 2 (directive and/or control sentence). The ratio of type 1 to type 2 sentences was calculated for the contextual Social Story (Appendix C) by each rater. For an agreement, the ratio had to be between 2.00 and 5.00 as judged by both raters (i.e., Gray recommended using two to five type1 sentences for every type2 sentence; the dividend [# of type1 ÷ # of type2] had to be >2 and <5). Inter-rater agreement was calculated by dividing the number of agreements by the sum of agreements plus disagreements, multiplied by 100 (paralleling agreement-per-occurrence; Salvia, Ysseldyke, & Bolt, 2006). Inter-rater agreement for adhering to Gray's sentence ratio was 100%; the obtained sentence ratio averaged at 3.57.

The readability of the Social Stories was also checked with the participants. Both Social Stories (Appendix B; C) were written at a 4.6 reading grade level (according to Microsoft Word's Flesh Kincaid Grade Levels). Although this reading level was above the minimum participation criterion of second grade level, it matched the average actual grade level of the participants (Table 3). All six participants were able to read their assigned (directive or contextual) stories fluently at initial reading.

A comprehension check was conducted after the initial reading of the Social Stories and prior to proceeding to skill practice. Three pre-formulated comprehension questions (Appendix B) related to key information presented in the stories and were printed on the inside back cover of the individual story books. The questions were the same for both story versions and were to be read immediately after the Social Story at each session until the participant could answer all questions (100% correct), to demonstrate comprehension of the concepts in his story. In case of apparent difficulties, the given Social Story formulation would be altered (see step #8; Table 2) for clearer understanding, to match the participant's needs and/or reading level. All six participants successfully answered the comprehension questions after initial reading. Thus, the initially developed Social Stories (Appendix B; C) were used for the intervention with all six participants; and even though individualization would have been possible and even obligatory if needed, for the selected six participants no modifications were shown to be necessary.

Materials.
The Social Stories and comprehension questions used in the current study were printed on white paper with a 16-point font, one paragraph per page. The contextual Social Story, containing more (social-contextual) information, was slightly longer than the directive Social Story; yet the difference was accounted for by a minimal, just one additional sheet (two single-paragraph pages) in the story book. The pages were mounted on mixed-color letter size construction paper, the white paper trimmed so that each page was framed by a strip of color showing. The pages were stapled to form a personal story book for each participant. The outside cover page displayed a summative title in a question-format (i.e., How do I set the table for my friends at 'Agency Program' at snack time?), to which each story represented an answer. The story books were hole-punched, mounted on a metal ring, and hung up on hooks in a designated area on the Agency Program room's wall so the participants could access their stories any time.

Implementation Procedures
Reading of Social Stories.
The Social Stories were read aloud one time at the beginning of each Agency Program session in individual staff-student pairs while they were seated at a table in a small, quiet, non-distractive room of the Agency Program area where routine activities of the Agency Program sessions occurred, and in which the target behaviors would naturally be displayed. Participants were asked to sit with a familiar staff member who then read the participants' personalized Social Stories with them, with as much active student reading as possible. For example, if a participant struggled with a word or phrase, staff would read aloud those words to them to ensure a fluent and meaningful reading of the stories.

Eventually, a fading schedule (step #10; Table 2) was introduced by gradually shortening each story. In case that the participants read their stories fluently (i.e., staff did not need to help with more than three words), and a change in the performance of the target behavior could be observed during intervention sessions; the intervention would be put on a fading schedule by gradually shortening the text of the stories. Specifically, both versions (directive or contextual) were to be gradually shortened by leaving out one, then two paragraphs from the beginning of the stories, describing the general settings and a larger context; whereas the latter paragraphs focused directly on the performance and explanation of the target behavior (Appendix B; C).

Because all six participants were able to read their stories independently (as defined above) and they successfully answered 100% of comprehension questions, plus a change in the performance of the target behavior could be observed in all cases after as few as two intervention sessions (Figure 1); the intervention was put on a fading schedule beginning at the third reading. The sentence types in the first two paragraphs of the contextual Social Story were varied, so the controlled fading out of these parts of the story has not affected the realization of Gray's sentence ratio (slight increase from 3.57 to 3.80; acceptable range is 2.00 – 5.00).

Organization of target behavior performance.
At snack times, once at mid-point during each Agency Program session, some students were routinely asked to help set-up for others, while the other students lined up and went to a bathroom to wash hands. For the purposes of this study, a schedule was created to ensure that all six participants were called to be on-duty for table setting sufficient times for baseline data collection, and so that they would be on-duty for table setting in the right order for the matched-pairs multiple baseline design (explained below). Each participant was observed for three baseline and four intervention sessions.

Each of the two participants assigned to be on-duty for table setting in each session, was asked to set a table for four students. The two tables for them to set were positioned at walls facing each other in the dining area, so the participants were working on the table setting task at their own tables facing opposite directions. Such precautions were taken because carry-over effects through the paired participants' possibly looking at and copying each other's behaviors could have confounded results (however, no obvious carry-over effects were observed, neither during baseline nor during intervention, for any of the matched pairs and any of the dependent measures (Figures 1; 2). Participants were asked to please set the table for snack time for their friends. Then they were handed four plates, four forks, four knives, four spoons, four cups and four napkins each, handed to them in one pile. At their first intervention session, participants were reminded to remember some instructions for the task they read about earlier that morning, and that their instructions may be different and given personally just for them in their own stories. No further instructions or prompts were given, and any questions raised by the participants were answered with the pre-coded response: *Do as you think it would be best.*

Data Collection and Analysis
Research design.
A matched-pairs multiple baseline design (Figure 1) was used. Two participants were paired on each of the three tiers of the multiple baseline design; one participant of each matched pair received instruction through a contextual Social Story, the other participant received instruction through a directive Social Story. Participants of the present study were similar in gender, age, literacy and communication skills; so matched participant pairs were created through random assignment.

An adapted (i.e., matched-pairs) multiple baseline design was chosen to counteract multiple-treatment interference or order/sequence effects that may have emerged in multiple or alternating treatment designs (Kazdin, 1982). When more than one treatment is administered to each participant, the possibility exists that the effect of one treatment may be influenced by the effect of another treatment (Campbell & Stanley, 1963). Within the matched-pairs multiple baseline design of the present study, each participant was administered only one treatment (i.e., either the directive or the contextual version of Social Stories). Thus, comparisons of performance for contrasting the two versions of treatment were conducted between, as opposed to within, participants. Comparisons were possible either between those participants making up each matched pair; or comparing the performance of several participants receiving the same version of treatment during the intervention phase, across the three matched pairs.

Scoring and graphing performance.
Baseline and treatment data were collected by recording performance relative to (a) criterion level (percentage of task-analyzed skill steps performed correctly); and (b) the number of trials-to-criterion. Data collected during baseline and treatment observations were graphed (Figure 1) and visually inspected. In addition, (c) response generalization data were collected on the placement of the napkin, along with any questions asked by the participants about napkin placement. Placement codes and questions were charted in a compact visual format for an easy overview and comparison (Figure 2).

For (a) scoring the placement of each utensil, a 'whole task' system, similar to whole-interval recording (Cooper et al., 2006), was selected. Specifically, on the finished table setting, all four of the same kind of utensil mentioned in the Social Stories and handed to the participants (i.e., all of four plates, forks, knives, spoons or cups) had to be in the correct position (as in Appendix A; B; C) in order for the response to be counted as 'correct' for the corresponding task analysis step. If one or more utensils of the same kind were out-of-place, no score was given for that TA step. This 'whole-task' recording system was selected because the target behaviors needed to be increased, and whole-interval / 'whole-task' recording tends to underestimate behavior, hence represents a more conservative system when judging increase in behavior (Bailey & Burch, 2002). When assigning a percentage of task-analyzed skill steps performed correctly, each 'correct' score was worth 20% (5 TA-steps/utensils X 20% = 100%). This percentage represented the actual criterion level score recorded for data analysis (Figure 1).

For (b) the number of trials-to-criterion, the number of intervention sessions were added up until the first full criterion level score (100%) was achieved. For instance, if a participant scored 60% of criterion in the first intervention session and 100% of criterion in the second intervention session, '2' was recorded for trials-to-criterion score. If no 100% criterion score could be assigned for a given participant at any session, 'N/A' (not applicable) was recorded as their trials-to-criterion score (Figure 1).

For (c) the ancillary dependent measure, the placement of the napkin (not mentioned in the Social Stories) was observed as response generalization check. Successful application of the note on predictability of the table setting, to a similar but untrained utensil to be positioned (i.e., the napkin), would result in consistent placement. When recording data, any (consistent) placement of the napkin was acceptable (because no specific position was prescribed in the Social Stories, as opposed to the other utensils). Thus, the idea of consistency in place setting defined a topographically broad response class.
The possible spatial positions for the napkin in relation to the other utensils were coded (L=left side of plate; R=right side of plate; U=under utensil[s]; P=on plate; O=over above plate) and recorded for each participant in each session (Figure 2). Combined placement codes were possible to be assigned (e.g., R;U = right side of plate and under utensil[s]; Figure 2).

Treatment Integrity and Reliability of Observations
The principal investigator and the program coordinator of the Agency Program independently monitored the applied components of the Social Stories intervention package. Using the evaluation column of the form presented in Table 2, raters tallied the steps that were appropriately carried out during the process of creating the Social Stories. Inter-rater agreement for the two raters was calculated by dividing the smaller number of tallied steps by the larger number of tallied steps, multiplied by 100 (Salvia et al., 2006). Total inter-rater agreement for following procedures for constructing Social Stories was 100%; with all applicable steps eventually tallied (i.e., rated as carried-out).

The principal investigator served as the primary observer for data collection during target skill performance (i.e., table setting). The program coordinator of the Agency served as co-observer for reliability checks of the observations. Near 20% (recommended by Kazdin, 1982) of all sessions (8 of 42) were co-observed. Retraining would occur if observers did not attain a minimum of 90% agreement on observations conducted intermittently throughout the study.

Reliability of observations on the primary dependent measures were calculated as a percentage, based on individual scores for (a) percentage of criterion (based on pre-defined task analysis steps) attained, and (b) number of necessary trials to criterion; using the formula: lower score divided by higher score multiplied by 100 (Kazdin, 1982; Salvia et al., 2006). Inter-rater agreement for (c) placement of the napkin (ancillary response generalization component) was calculated by dividing the number of agreements by the sum of agreements plus disagreements, multiplied by 100 (agreement-per-occurrence; Salvia et al., 2006). Overall mean inter-rater agreement for the reliability of observations was 93.2% with a range from 86.58% – 100%.
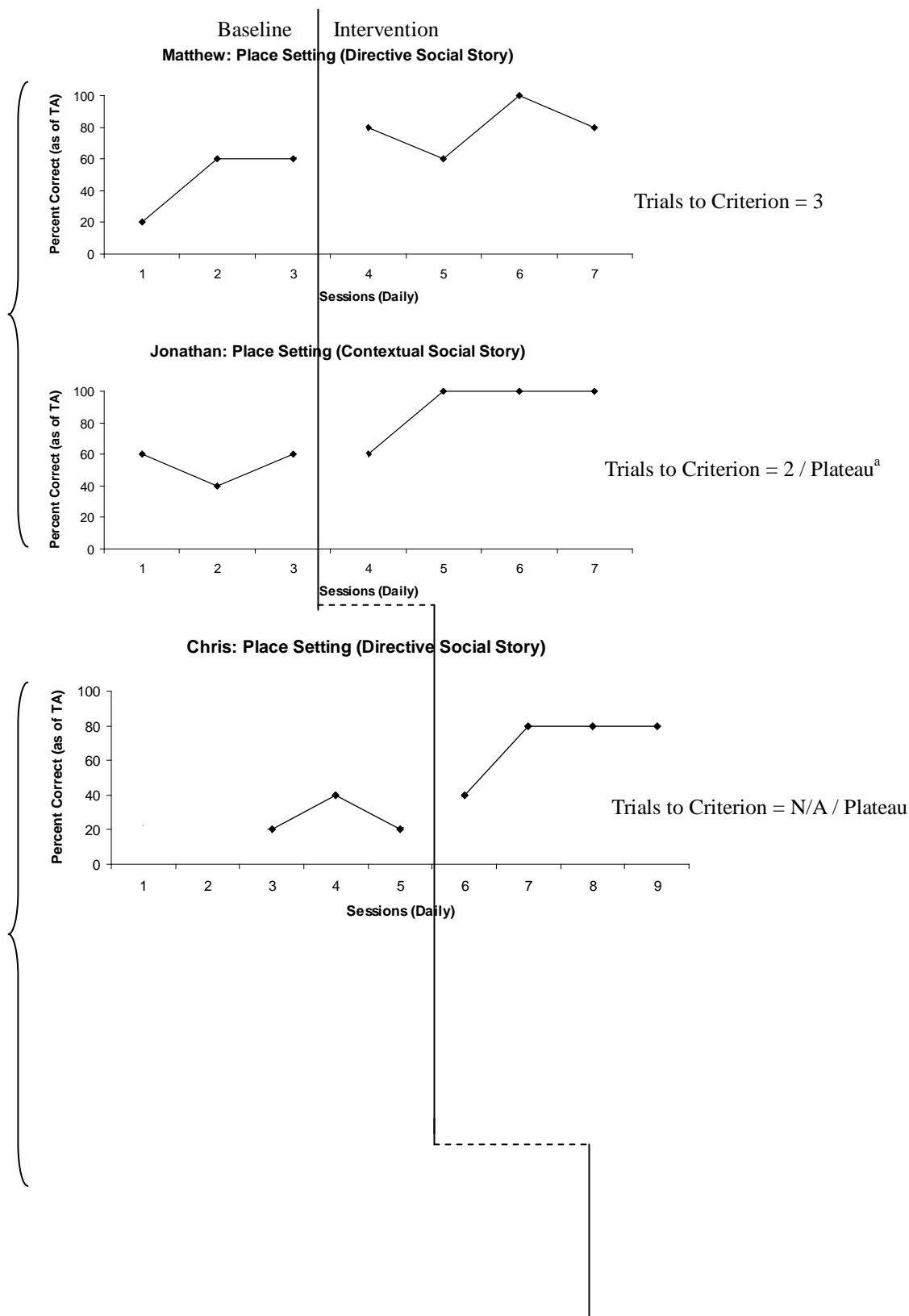
Results
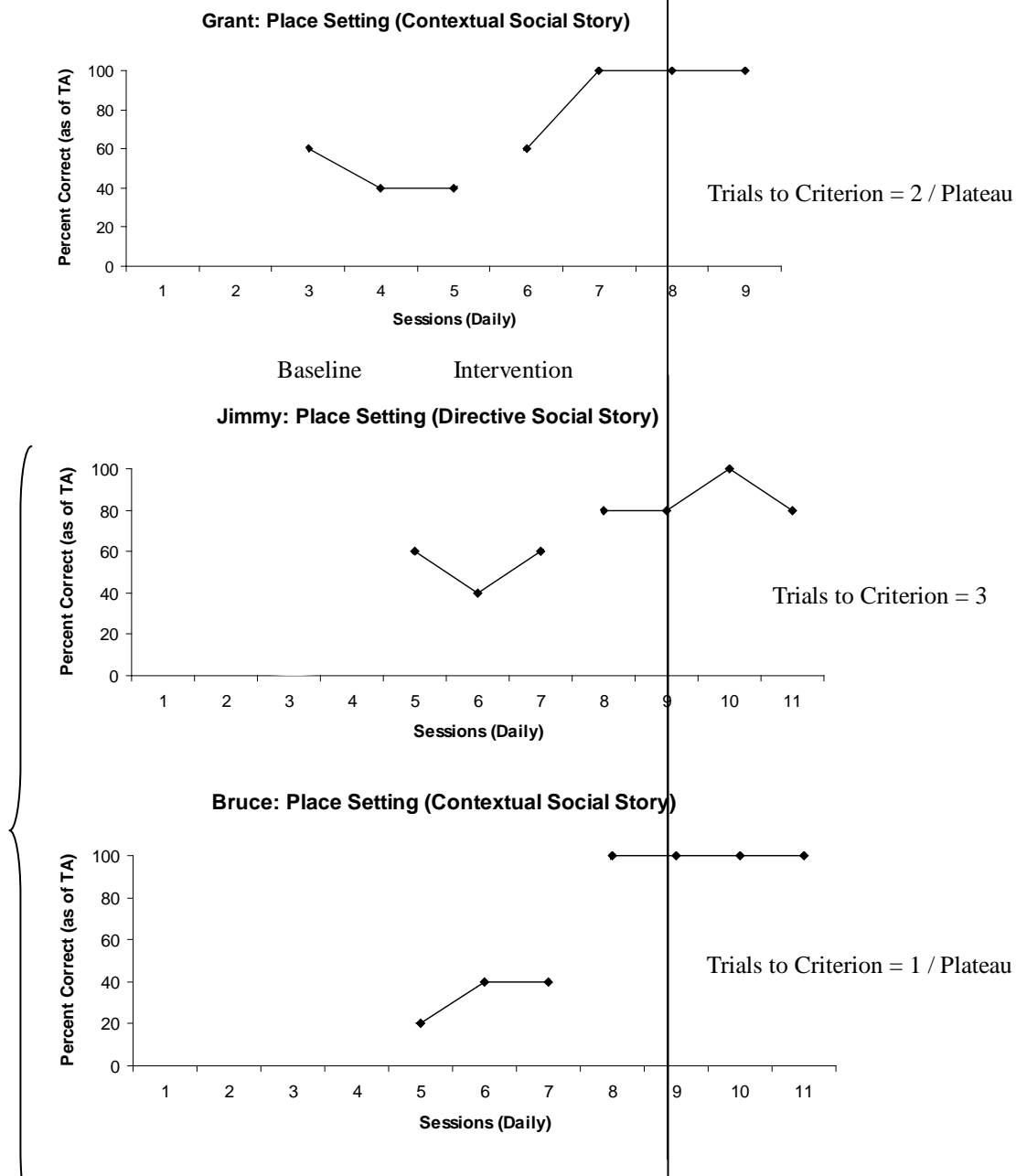*Dependent Measures*
Criterion level.
Figure 1 shows the performance graphs of the participants. Five participants demonstrated improved performance of the target behaviors immediately after the first intervention session and the sixth participant (Jonathan) following the second intervention session. Performance levels consistently remained above corresponding baselines. Five participants reached 100% of criterion. One participant's (Chris) performance reached a plateau at 80%. Three participants (Jonathan, Grant, Bruce) reached a stable plateau at 100%. Within the matched pairs, participants did not copy each other's behaviors and their performances remained distinct in both baseline and intervention sessions (Figure 1).

The three participants who read the contextual Social Story (Jonathan, Grant, Bruce), demonstrated more consistent and stable performance levels during intervention sessions than did the readers of the directive Social Stories. Further, the three participants who read the contextual Social Story all reached a plateau at 100%, whereas none of the directive Social Story readers did (Figure 1).

Number of trials-to-criterion.
Figure 1 notes the number of intervention sessions necessary to reach 100% performance level criterion. One contextual Social Story reader (Bruce) needed only one trial to reach criterion, and the remaining two contextual Social Story readers (Jonathan and Grant) reached 100% of criterion after two trials. Two directive Social Story readers (Matthew and Jimmy) reached 100% of criterion after three trials, and the remaining one directive Social Story reader (Chris) did not reach 100% of criterion at all. Once reaching criterion, all three contextual Social Story readers (Jonathan, Grant, Bruce) have maintained their performance at criterion level, whereas the two directive Social Story readers who reached criterion (Matthew and Jimmy) both regressed in their performances and did not maintain a stable plateau throughout the intervention phase (Figure 1).

Trials to Criterion = 3

Trials to Criterion = 2 / Plateau[a]

Trials to Criterion = N/A / Plateau

Grant: Place Setting (Contextual Social Story)

Trials to Criterion = 2 / Plateau

Baseline   Intervention

Jimmy: Place Setting (Directive Social Story)

Trials to Criterion = 3

Bruce: Place Setting (Contextual Social Story)

Trials to Criterion = 1 / Plateau

Note. [a]Plateau is defined here as stable performance maintained over several sessions at a given level and not changing any more over the course of intervention for a given participant.

Figure 1. Performance Graphs of Social Story Interventions

Generalization data.
Response generalization data were collected on the placement of the napkin (not included in the Social Stories but given to participants with the other utensils for setting the table). In addition, questions asked by the participants about napkin placement were noted. Figure 2 presents the placement codes and questions asked by participants. Similarly to the variables charted in Figure 1, performance did not show evidence of participants within the matched pairs copying each others' behavior, neither in baseline nor in intervention phases.

None of the six participants demonstrated consistent napkin placement during baseline. During intervention, all three directive Social Story readers (Matthew, Chris, Jimmy) had variability in the napkin placement. All three contextual Social Story readers (Jonathan, Grant, Bruce) showed stable and consistent patterns of napkin placement during all intervention sessions. Bruce (a contextual Social Story

reader), the only one participant having done so, adapted a napkin placement in the treatment sessions that he had not at all used during baseline; and Jimmy, his matched pair, has not used/copied that position either (Figure 2).

All three contextual Social Story readers (Matthew, Chris, Jimmy) asked a question about the napkin's placement (Grant and Bruce in the first, Jonathan in the second intervention session). None of the directive Social Story readers (Matthew, Chris, Jimmy) asked questions (Figure 2).

Sessions:	#1	#2	#3	#4	#5	#6	#7
	Baseline Treatment						
Student (Story Type)	*Napkin Setting*[b] *(without Directions) and Questions Asked*:						
Matthew (Directive Social Story)	P	O	P	P	O	O	P
Jonathan (Contextual Social Story)	O	P	P	P	P / "Where do these [i.e., napkins] go?"	P	P
Chris (Directive Social Story)	P	R	P	P	O	P	O
Grant (Contextual Social Story)	P	L; U	P	L; U / *right before task*: "Great, I knew this was gonna come 'cause I read about it this morning"; *during task*: "Shall I put the napkins under the fork?"	L; U	L; U	L; U
Jimmy (Directive Social Story)	P	P	O	P	O	O	P
Bruce (Contextual Social Story)	P	O	P	L; U / "Where do napkins go, that was not in the story."	L; U	L; U	L; U

Note. [a]The placement of the napkin – even though not included in the Social Stories – was recorded for exploring generalization of the message of the contextual Social Story about predictability of the place setting: "Is there a reason why this place setting came to be a tradition? If people do things, like setting the table, in a similar way all the time, everybody will learn how this is done. People would find the same set-up when they go to a restaurant or to a friend's house. This way, people will not be surprised, and they will easily find everything they need at the table, right where they learned it should be". Questions raised about the placement of the napkin would be answered with the pre-coded formula: "Do as you think it would be best". [b]L=left side of plate; R=right side of plate; U=under utensil(s); P=on plate; O=over above plate.

**Figure 2. Placement of Napkin and Questions Asked About its Positioning
(Not Included in Social Stories)[a]**

Social Validity

The target behavior of table setting was preliminarily judged by Agency staff as age appropriate and socially valid for this group of 9-13 years of age to perform. Later during the intervention, five staff members were asked to give formal ratings on the acceptability of the goals using a 1-5 Likert-type scale. Table 4 lists the questions used to rate the social acceptability (based on quotes from the Social Story books), the rating code (i.e., verbalized evaluation assigned to the numbers 1-5), and the obtained social validity ratings per question and staff member, plus total average ratings per question. Total average inter-rater score for acceptability of goals was 4.40 with an individual range from 3 – 5, on the 1-5 Likert-type scale.

Five staff members (present with the group of children during the study) were asked to give social validity ratings on the unobtrusiveness / ease of implementation of the intervention (i.e., reading Social Story with student, once at the beginning of each Agency Program session). Table 4 shows the actual questions to rate (based on quotes from the Social Story books), the rating code using a 1-5 Likert-type scale, and the obtained social validity ratings per question and staff member, plus total average ratings per question. Total average inter-rater score for the unobtrusiveness and ease of implementation was 4.40 with an individual range from 4 – 5, on the 1-5 Likert-type scale.

Discussion
This study sought to establish the relative importance of applying Gray's sentence ratio as a component in a Social Stories intervention package teaching table setting skills to students with ASD. Results suggested that when leaving other intervention components constant in a 10-step approach to constructing and implementing Social Stories (Tarnai et al., 2009), a contextual Social Story (adhering to Gray's sentence ratio) yielded fewer trials to criterion and maintained stable performance at criterion when compared to a directive Social Story (omitting Gray's sentence ratio). In addition, a contextual Social Story promoted response generalization. These findings suggest that the social-contextual component of Gray's Social Story composition guidelines (instrumented through her sentence ratio) is a necessary part of the intervention.

Table 4. Social Validity Rating of Social Story Implementations by the Human Service Agency Program Staff[a]

Target Behavior	Expected Outcome	Rater	Is Goal Acceptable?[b]	Is Intervention Unobtrusive and Easy to Implement?[b,c]
"Later today I will do the job of serving my friends at snack time. I will set the table. ... This picture shows what the place setting will look like that I will do:" (*quoted from Story book*)	"Setting the table properly is a skill I can use in many places when I help serving my friends or family at a meal we are having together. People will notice that I can help in a grown-up way, and they will be proud of me!" (*quoted from Story book*)			
		Staff #1	5	5
		Staff #2	3	4
		Staff #3	5	4
		Staff #4	4	4
		Staff #5	5	5
		TOTAL AVERAGE	4.40	4.40

Note. [a]Average values for goal/obtrusiveness calculated with ratings obtained from five Agency Program staff members. [b]1-5 scale: 1=strongly disagree; 2=disagree somewhat; 3=indifferent; 4=agree somewhat; 5=strongly agree. [c]Implementation: reading Social Story with student, with as much active student participation as possible, once at the beginning of each Agency Program session.

The Text of a Social Story – Social Elaboration through Gray's Sentence Ratio
Extending the research base.
Gray's (1995, 2003) intuitive recommendations for a social-contextual framework to mere task-analytical instruction of a target skill do parallel research findings in the literature. Scott et al. (2000) suggest that social communication training for individuals with autism should involve instruction on 'who to ask' and 'when to ask' beyond the technique of asking a question, that is, 'what words to use' (pp. 257). Myles (2005) theorized that Social Stories may help individuals with ASD map out relevant cues and understand contexts of behavior. Along this line of thought, added social-contextual information may aid instruction for similar reasons to those Bandura (1974; 1977) and colleagues (Bandura & Huston, 1961; Bandura, Adams, & Beyer, 1977) outlined in their social learning theory. According to Bandura (1977), reductions in fear, presented symbolically (situational circumstances in which behavioral attainments occur) improve self-efficacy. Mapping out environmental cues and contexts of target behavior performance through Social Stories may serve as a means of reducing fear of the unknown, and resistance to change of routines; easing a characteristic burden to initiating (social) behaviors by individuals with ASD (APA, 1996).

Khemka (2000) and Khemka et al. (2005) found in empirical studies that a decision-making training approach for students with cognitive disabilities, which addressed both cognitive (i.e., knowledge of facts) and motivational (i.e., personal and community values; goal-awareness and goal-directedness) was superior to a cognitive-only training approach. Their findings parallel Gray's experience-based, but not evidence-supported, intuitive suggestions (1995; 2003) for adding broader, social-contextual information to a Social Story; which she intended to guarantee through the vehicle of a ratio of specific sentence types in a Social Story (Table 1).

The present study replicates Khemka's (2000) and Khemka et al.'s (2005) findings in the context of a Social Stories intervention package to teach table setting skills to students with ASD; and the results offer evidence-based support for using Gray's sentence ratio. These outcomes extend the field's knowledge base about efficient implementation of Social Stories and reinforce the use of broader, social-contextual information when explicitly teaching a target skill.

Further, highlighting a justification for the performance of the target behavior taught, in addition to merely teaching the technical aspects necessary for successful performance, appears to promote generalization across related behaviors justified by the social-contextual framework. Results on response generalization are preliminary and need to be further explored. The potential of response generalization through contextual Social Stories (i.e., adhering to Gray's sentence ratio) is promising because individuals with ASD typically have difficulties to generalize the use of skills that were trained explicitly but in isolation (Batshaw, 2002).

The positive outcomes on the generalization measure cannot be considered unexpected because the contextual Social Story version contained explicit information relating to the reasons for, and advantages of, performing the target skill and maintaining a predictability of the place setting. Thus, Gray's sentence ratio and sentence classification served as an operationalized tool for social elaboration of the context of target skill performance. Gray's guidelines ensured that direct instruction on social-contextual cues and backgrounds was included in the instruction, as opposed to the purely task-analysis-guided directive Social Story version. It is not impossible that intuitive, non-planned social elaboration would occur when teaching a student perform a skill with a TA, for instance, by answering spontaneous questions or verbally pointing out cues in the environment. However, there would be no direct and explicit safeguard for the inclusion of such information which, based on the results of the present study, appears to be valuable for teaching efficiency. On the other hand, contextual Social Stories (i.e., the version Gray [1995] originally suggested) explicitly include a tool for social-contextual elaboration, for which Gray's sentence classification and suggested sentence ratio serve as one possible, operational means.

Classifying question sentences.
A novel issue arose when applying Gray's sentence ratio to an emerging Social Story. When the independent raters checked the adherence to Gray's ratio, question sentences in the text (Appendix C) presented a dilemma. Gray's classifications (Table 1) have not specifically addressed the question format. From a practical point of view, for calculating a sentence ratio, it needed to be decided whether to consider a question a type 1 (descriptive, perspective and/or affirmative) or a type 2 (directive and/or control) sentence.

Since directive and control sentences are to describe either a concrete behavioral response or a strategy to be used (Table 1), and given that a question by its nature lacks such pre-set guidance, both raters have independently coded questions as type 1 sentences, without assigning them to a specific class (i.e., descriptive, perspective and/or affirmative; Table 1). However, because of the low quantity (two) of question sentences in the contextual Social Story (Appendix C), Gray's sentence ratio would remain within the acceptable range even if those two sentences were omitted from the text (ratio would change to 3.29 instead of the currently rated 3.57; acceptable range is between 2.00 – 5.00); thus, the issue did not represent a confounding factor in the present study. Nonetheless, future research should address the matter.

Instrumentation and Implementation of Social Stories
Participants/Settings.
Only male students (no females participated in the Agency Program sessions in the given summer) were selected to participate in the study. All six participants had good literacy skills and were able to read chronologically age-appropriate grade-level material (Table 3). Social Stories are supposed to be flexible in their construction and adaptable to different reading levels, as needed by their users; but the conditions of the present implementation did not allow for testing such flexibility. However, the limited variability of participant characteristics as a potential weakness of the study is counterbalanced by the fact that the intervention was successful within a natural setting and with an intact group, which supports the practical utility of the intervention for practitioners in real-life implementations.

Independent measures – Procedures.
One possible practical advantage of Social Stories in some instructional situations may be that instruction is 'removed' from skill practice in the actual settings and from actual expected performance times. Thus, the intervention is relatively unobtrusive and requires low supervision from the instructor at actual performance times. This has proven itself to be true for the present study, as evident from the social validity ratings by staff on the ease of implementation (average score of 4.40 on a 1–5 Likert-type scale; Table 4).

The reading of the stories quickly became a routine and participants were happy to do it again and again, before Agency Program activities would start for the day. Adherence to routines, which typically is strength of students with ASD (Scott et al., 2000) renders Social Stories a well-suited intervention for this population. Another primary strength of individuals with ASD lies in visual processing (Scott et al., 2000). That is, individuals with ASD often learn and interpret information through things that are seen rather than heard (Myles, 2005). Rosenshine (1997) advocated for the use of graphic organizers for improved cognitive processing. Social Stories or scripts take advantage of strength in visual processing by supplying individuals wit ASD with a written (i.e., permanent) text and are recommended for this population for this specific reason (Scott et al., 2000).

Gray first discouraged (1995), then allowed but did not require (2003), the use of graphical visual aids for supporting the text of a Social Story. It could be questioned whether visual aids themselves would be sufficient to teach target skills. The Social Stories developed for the present study did contain, identically in both versions, a picture of the target place setting; yet, as performance data suggest, the visual representation alone did not lead to 100% performance levels and the differences within the story/text structure of the two versions parallelled differences in performance levels (Figure 1; 2).

Implementations of Social Stories interventions are typically relatively short, spanning over 4-19 days of treatment, as reported in the literature review by Tarnai et al. (2009). In the present study, three baseline sessions and four intervention sessions were run with each participant, adding up to seven sessions per participant. This duration is similar to other studies involving Social Stories, and the treatment manifested clear effects within this time period (Figure 1). However, for clinical significance, future replication studies should follow-up longer implementation periods to demonstrate clear practical advantages on teaching efficiency.

Dependent measures.
For the purposes of the present study, a 'whole task' system was selected for scoring the placement of each utensil, i.e., all four of the same kind of utensil mentioned in the Social Stories and handed to the participants had to be in the correct position in order for the response to be counted as 'correct'. If one or more utensils of the same kind were out-of-place, no score was given for that TA step. This 'whole-task' recording system represents a more conservative system when judging increase in behavior (Bailey & Burch, 2002). As a disadvantage, the 'whole task' system is less sensitive to small changes in behavior and may under-score performance that is partially correct but not perfect. On the other hand, the system is able to clearly differentiate 100% performance from lower-than-criterion level performances of any kind. Because the main goal and criterion was defined for the present study and in the Social Stories adhering to Gray's sentence ratio as consistency of place settings, it was less important to analyze what types of from lower-than-criterion level performances occured than to detect criterion level (100%) performances per se. In this case, more sensitive measures would have provided too much insignificant detail whereas the 'whole-task' recording system focused more clearly on the primary dependent measure of interest: criterion level (100% of the task-analyzed skill steps performed appropriately) and trials-to-criterion.

Two of the six baselines (Matt and Bruce, Figure 1) show a slight increasing trend which could represent a confounding factor. In comparison with the other four participants, however, the participants with the slightly increasing baselines showed similar performance patterns to others. Additionally, Matt and Bruce belonged to different treatment conditions and different matched pairs. Matt read a direcrive story and showed, similarly to other directive story readers, variable performance during implementation sessions; and Bruce read a contextual story and showed, similarly to other contextual story readers, a plateau at 100% perfomance level.

Limitations of the Study – Future Research Directions
Social Stories draw on a visual strength that many individuals with ASD typically may have, and offer a structured, tangible organization of social concepts that many individuals with ASD typically may need. The present study initiated a component analysis of a literature-based (Tarnai et al., 2009) model intervention package (Table 2) addressing the practical utility of applying Gray's sentence ratio. Results support the efficiency of Gray's sentence ratio within the given framework; yet, some open questions still remain.

The limited variability in participant characteristics did not allow for testing the flexibility of Social Stories' construction in terms of being adaptable to different student functioning levels as needed. Only male students were selected to participate, and all six participants had good literacy skills and were able to read chronologically age-appropriate grade-level material (Table 3). It would be useful to follow-up on the positive outcomes and explore if the same results would hold for different participants and/or in different settings than the ones tested in this study.

Social Story construction guidelines (specifically, sentence typology) need to be revised in light of the dilemma presented by question sentences. Gray's classifications (Table 1) have not specifically addressed the question format. From a practical point of view, Gray's sentence ratio would have remained within the acceptable range for the contextual Social Story used in the present study (Appendix C), even if the two question sentences were omitted. Yet, simply omitting questions from Social Stories does not deliver an empirical answer to issues of sentence typology, sentence ratio calculation, and practical (in)significance of their use in Social Stories. It needs to be examined whether questions could be assigned to an already existing sentence type, or if a new category needs to be created for accurate sentence ratio calculation.

For the purposes of this study, no additional strategies (step #5 of the 10-step approach; Table 2) were used to support learning of the target behavior beyond a basic model intervention package; in order to allow a focus on the component analysis addressing Gray's sentence ratio. Nevertheless, in situations where clinical utility played more important a role than research rigor, target behaviors might be addressed even more effectively with added strategies / materials known as good instructional practices (and reported as being used jointly with Social Stories in some studies, e.g., Barry & Burlew, 2004; Reynhout & Carter, 2006). Such additional strategies / materials may include contrived reinforcement schedules, functional communication training, additional pictures or graphic organizers (Barry & Burlew, 2004; Reynhout & Carter, 2006; Tarnai & Wolfe, 2008). The present study did not examine such factors' contribution to treatment efficiency. To support the work of practitioners, prospective research should address the issue.

Conclusions
The application of empirically validated, good instructional practices as components of Social Stories intervention packages (Yarnall, 2000; Elder, 2002; Reynhout & Carter, 2006; Tarnai & Wolfe, 2008), as well as building on visual and routine-adherence strengths (Scott et al., 2000) renders Social Stories a well-suited intervention for individuals with ASD. The present study was able to deliver empirical support for using Gray's sentence ratio in Social Stories, justifying the effort that the adherence to the ratio requires when constructing a story.

However, Gray's sentence ratio is certainly not the only effective component in a Social Stories intervention package. Reynhout and Carter (2006) argue that there may be other elements within such intervention packages, for instance reinforcement and explicit teaching that has much effect on students. Other research-based 'good practices' of effective instruction should not be neglected when planning Social Stories interventions for individuals with ASD.

The present intervention was successful within a natural setting and with an intact group, which supports its practical utility for implementation. Furthermore, the intervention was non-intrusive as supported by social validity data. Further research is needed to refine Social Story construction for different student populations with varying characteristics, and to elaborate the use of question sentences within Gray's typology. Then, with some further component variables (supplementary strategies and/or materials) validated empirically, Social Stories, applying Gray's sentence ratio, have the potential to become a powerful, research-based instructional strategy.

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Appendix A. Task Analysis for Place Setting

How do I set the table for my friends at Agency Program at snack time?

- Place plate on the table, in front of your Agency Program friend, in the middle.
- Place fork on the left side of the plate.
- Place knife on the right side of the plate.
- Place spoon on the right side of the knife.
- Place cup on the upper left side, beyond the plate, and near the head of the fork.

The order of performing the TA steps does not count in scoring, only the end result (total correct) does (i.e., the correct layout of the dining utensils, in accordance with the graphic).

Appendix B. Place Setting Directive Social Story

How do I set the table for my friends at Agency Program at snack time?

Later today I will do the job of serving my friends at snack time. I will set the table.
I will put out a plate for every kid at my table. I will also put out a fork, a knife, and a spoon for every kid at my table. I will put out a cup for every kid at my table, as well.

There is a certain way I will put these things on the table. I will set the table like this:
I will place a plate in front of my Agency Program friend, in the middle.
I will place a fork on the left side of the plate.
I will place a knife on the right side of the plate.
I will place a spoon on the right side of the knife.
I will place a cup on the upper left side, near the head of the fork.
This picture shows what the place setting will look like that I will do:
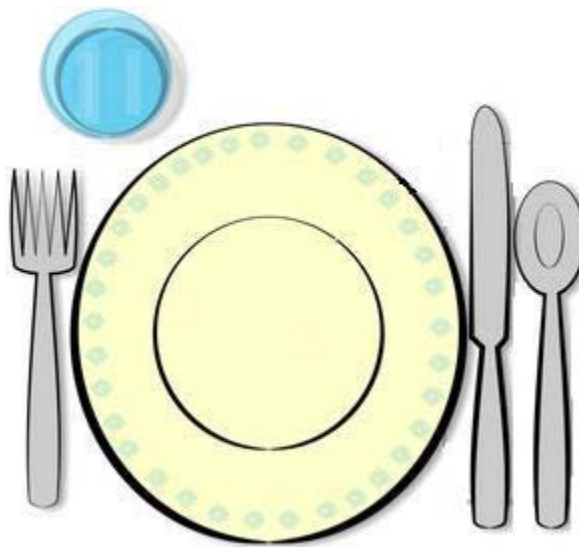
It does not matter in what order I put a plate, a fork, a knife, a spoon, and a cup on the table. I will repeat the same settings for each of my Agency Program friends at my table.

This is how I will practice setting the table for my friends at snack time.

*Comprehension Questions [*same for both (directive and contextual) Social Story versions*]:

1. What job am I going to do later today at snack time?

2. Does it matter where I will put a fork for my Agency Program friends?

3. Where am I going to put a cup for my Agency Program friends?
    I will put a cup _____ (say where you are going to put it).
    I can show the cup in the picture, too (point to the cup in the picture, please).

Appendix C. Place Setting Contextual Social Story

How do I set the table for my friends at Agency Program at snack time?

It is fun to be at Agency Program! I can play games or read a book in free time. In circle time, we share interesting things that happened to us in school or at home. We also play group activities. Then I will work on a project together with the other kids.

There is the Agency Program Bank, too. I can earn dollars for a job I do well. I will sign up for a job. Later today I will do the job of serving my friends at snack time. I will set the table.

When a table is set for guests at a restaurant, or in many homes, there is a certain way this is done. This is a custom in our culture and setting a table is done in a very similar way in many homes and restaurants, and in many countries.

When people set the table for gests, they do it like this:
We place a plate in front of each person, in the middle.
We place a fork on the left side of the plate.
We place a knife on the right side of the plate.
We place a spoon on the right side of the knife.
We place a cup on the upper left side, near the head of the fork.
This picture shows what a proper place setting looks like. Have you seen this before?

Is there a reason why this place setting came to be a tradition? If people do things, like setting the table, in a similar way all the time, everybody will learn how this is done. People would find the same set-up when they go to a restaurant or to a friend's house. This way, people will not be surprised, and they will easily find everything they need at the table, right where they learned it should be. We don't have to look and search a long time to find where a spoon is. We would know exactly where to find it, on the right side of the plate, even if somebody would prefer to use their left hand to actually hold the spoon to eat with.

I think I am old enough to learn how to properly set the table when I do the job of serving my friends at snack time, here at Agency Program. I will put out a plate, a fork, a knife, a spoon, and a cup for every kid at my table. It does not matter in what order I put these on the table, but I will make sure I put them in the right place, just like in the picture. I will repeat the same setting for each of my Agency Program friends at my table.

Setting the table properly is a skill I can use in many places when I help serving my friends or family at a meal we are having together. People will notice that I can help in a grown-up way, and they will be proud of me!