JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2001, **34,** 425–446 NUMBER 4 (WINTER 2001)

SOCIAL STORIES, WRITTEN TEXT CUES, AND VIDEO FEEDBACK: EFFECTS ON SOCIAL COMMUNICATION OF CHILDREN WITH AUTISM

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This study investigated the effects of written text and pictorial cuing with supplemental video feedback on the social communication of 5 students with autism and social deficits. Two peers without disabilities participated as social partners with each child with autism to form five triads. Treatment was implemented twice per week and consisted of 10 min of systematic instruction using visual stimuli, 10 min of social interaction, and 10 min of self-evaluation using video feedback. Results showed increases in targeted social communication skills when the treatment was implemented. Some generalized treatment effects were observed across untrained social behaviors, and 1 participant generalized improvements within the classroom. In addition, naive judges reported perceived improvements in the quality of reciprocal interactions. These findings support recommendations for using visually cued instruction to guide the social language development of young children with autism as they interact with peers without disabilities.

DESCRIPTORS: autism, communication, visual cues, videotape feedback, peer interaction

It is recognized that elementary students with autism demonstrate a restricted range of social communication skills such as limited speech to initiate comments, request information from others, listen and respond to others, and interact in simple games (VanMeter, Fein, Morris, Waterhouse, & Allen, 1997; Volkmar, Carter, Grossman, & Klin, 1997; Wetherby & Prutting, 1984). This limited repertoire of social communicative behaviors may interfere with academic progress and friendship development. Identifying effective interventions that improve social competence may lead to more positive outcomes with typical peers. For example, peer-mediated social interventions have been successful in increasing social communication of children with autism (Haring & Breen, 1992; Kamps et al., 1992; Pierce & Schreibman, 1995; Sasso, Peck, & Garrison-Harrell, 1998); however, few peer-mediated interventions take advantage of the reported visual strengths of children with autism.

Only a few reports have focused on the use of written or text-based visual cues to teach specific social communication skills to children with autism as they interact with typical peers (Garrison-Harrell, Kamps, & Kravits, 1997; Kamps, Potucek, Lopez, Kravits, & Kemmerer, 1997). Studies focusing on unique competencies of some children with autism have revealed particular strengths in visual-perceptual skills (Lincoln, Courchesne, Kilman, Elmasian, & Allen, 1988), processing and interpreting static visual stimuli (Hodgdon, 1995), hyperlexia (Whitehouse & Harris, 1984), and verbal communication (Tsai, 1992). Hyperlexia has been described as a preoccupation with letters and words at an early age, and exceptional word-recognition skills with delayed comprehension of meaning (Healy, 1982). Quill (1997) recommended using visually cued instruction (e.g., graphic cues) to improve social behavior.

Support for this research was provided by Grant CFDA 84.023B from the U.S. Department of Education, Office of Special Education and Rehabilitative Services. We acknowledge the assistance of Kimberly Crawford and Gina Easterly in the implementation of this study.

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Types of visual cues that improve social communication of children with autism include written prompts and pictorial cues (Kistner, Robbins, & Haskett, 1988; Krantz & McClannahan, 1993), video feedback, and self-modeling of social behaviors and conversational skills (Charlop & Milstein, 1989; Hepting & Goldstein, 1996; Kern-Dunlap et al., 1992). Kistner et al. took advantage of the word-recognition skills of a girl with autism and hyperlexia to improve her functional language skills with adults. Written prompts (e.g., verbal prompt: "What do you want?" written prompt: "Want cookie.") were effective in teaching responses to questions, with progress being maintained following the removal of written cues. Individualized written social scripts also have been used effectively to teach elementary students with autism to initiate and respond to other classmates with autism (Krantz & McClannahan). An intervention combining social initiation training and video feedback increased the frequency and length of positive interactions and decreased inappropriate social behavior of a high-functioning child with autism as he played with a peer without disabilities (Oke & Schreibman, 1990). Video feedback of the dyad's previous interactions was used to teach the child to differentiate parallel and interactive play and successful or unsuccessful initiations.

Gray (1995) recommended using "social stories" to help high-functioning individuals with autism gain an accurate understanding of social situations. Social stories include four to six sentences that describe factual information regarding a social situation, possible reactions of others in that social situation, and directive statements of appropriate or desired social responses. However, studies documenting the effectiveness of social stories as a visual tool to improve social behaviors of children with autism are limited (cf. Hagiwara & Myles, 1999; Norris & Dattilo, 1999). Norris and Dattilo evaluated the effects of social stories on social behaviors of an 8-year-old girl with autism. Following intervention sessions consisting of reading social stories, the child continued to demonstrate some inappropriate social skills during lunch with peers, and no changes were noted in appropriate social skill use. Therefore, the successful use of social stories to modify social behaviors of children with autism awaits further study.

In summary, preliminary evidence exists for the benefits of using visual stimuli to improve social communication of children with autism. Given the unique differences in social, cognitive, and communication behaviors of this population, some treatment approaches may be more beneficial than others. Treatment strategies that take advantage of children's visual and verbal strengths may improve areas of weakness such as social communication. For children with verbal language and reading abilities, this could be accomplished by using visually coded information such as social stories, pictorial or written text cues, and video feedback. This study examined the effects of combining different visual cues on the social communication of elementary students with autism. Typical peers participated as conversation partners. The specific questions addressed were: (a) Does a treatment program consisting of pictorial and text-based cueing (i.e., social stories, pictures of social skills, and written social phrases) with supplemental video feedback affect specific social communication skills of elementary students with social impairments? (b) Do the treatment effects generalize to regular education classroom settings? (c) Do naive judges' perceptions of the quality of the children's social interactions change after the treatment?

METHOD

Participants

Five children with social impairments and 10 of their peers without disabilities (2 from

Table 1
Participants' Test Performance

Test	Participants									
	Dan		Greg		John		Casey		Ivan	
CARS	25		39.5		35		36		30	
	Nonautistic		Severe		Mild-moderate		Mild-moderate		Mild-moderate	
PPVT-R	67		<41		<40		<40		64	
TOLD-2 primary:										
Oral vocabulary			1P		1P		2P			
Grammatic understanding			<1P		1P		<1P			
Grammatic completion			1P		1P		2P			
CELF-3:										
Sentence assembly	2P								1P	
Formulated sentences	1P								1P	
Recalling sentences	1P								1P	
TONI-2	3P		19P		9P		37P		3P	
SSRS:										
Parent report:										
Social skills	84		71		84		60		68	
Problem behaviors[a]	100		131		110		100		118	
Teacher report:	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Social skills	82	87	59	91	106	103	82	84	59	91
Problem behaviors	106	112	135	115	135	120	120	113	135	115
WRMT-R: WI subtest	87		65		77		120		65	

Note. CARS, Childhood Autism Rating Scale (Schopler, Reichler, & Rochen-Renner, 1988); PPVT-R, Peabody Picture Vocabulary Test–Revised (Dunn & Dunn, 1981); TOLD-2, Test of Language Development—2 Primary (Newcomer & Hammill, 1988); CELF-3, Clinical Evaluation of Language Fundamentals (Psychological Corporation, 1994); TONI-2, Test of Nonverbal Intelligence (Brown, Sherbenou, & Johnsen, 1990); SSRS, Social Skills Rating System (Gresham & Elliott, 1990); WRMT-R Woodcock Reading Mastery Tests—Revised (Woodcock, 1998). All scores reported are standard scores, with the exception of raw scores reported for the CARS and percentiles reported for TOLD-2 Primary, CELF-3, and TONI-2.

[a] Problem behaviors scale on the SSRS assesses negative behaviors, therefore higher scores equal more problem behaviors than the average student in the standardization comparison group.

each focus child's classroom) from one elementary school participated in the study. The children were assigned to a triad, consisting of 1 child with social impairments and 2 peers without disabilities (total of five triads). The 5 focus children were boys ranging in age from 6 years 6 months to 12 years 2 months (M = 9 years 2 months) who were enrolled in Grades 1 through 5. All focus children were registered with the Florida State University's Center for Autism and Related Disabilities. Results of standardized testing are summarized in Table 1. None of the focus children or their peers demonstrated hearing, vision, or physical motor impairments. For inclusion in the study, focus participants demonstrated (a) impaired social communication, (b) emerging or acquired word-identification skills, (c) functional verbal communication (i.e., were able to communicate basic wants and needs using phrases or simple sentences), and (d) full or partial inclusion in regular education.

Dan (age 11 years 6 months) was fully integrated in fifth grade and received resource support for most academic subjects under the diagnosis of language impaired. Recent testing revealed that he scored just below the range for autism on the Childhood Autism Rating Scale (CARS; Schopler, Reichler, & Rochen-Renner, 1988). Social impairment was confirmed through parent

and teacher reports of delayed social skills on the Social Skills Rating System (SSRS; Gresham & Elliott, 1990) and more than 50% social deficits across three social observations (i.e., small-group work, recess, and music) using a social conversational skills checklist. Dan communicated using simple sentences, mainly directed to adults. Initiations to peers were minimal. His word-identification skills were at the 3.4 grade level on the Woodcock Reading Mastery Test—Revised (WRMT-R; Woodcock, 1998), and he comprehended sentence-level text.

Greg (age 7 years 6 months) attended a regular first-grade classroom approximately 30% of the day. He had been diagnosed with autism and scored in the severe range of autism on the CARS. Greg demonstrated severe delays in vocabulary and grammar; however, he made verbal requests and comments using sentences and scripted utterances. He often initiated rough-and-tumble games with peers during recess. Greg knew all letter names, could associate sounds to letters in simple words, and recognized some sight words.

John (age 8 years 2 months) was fully integrated in a regular first-grade classroom. He scored in the mild to moderate range of autism on the CARS. He conversed using simple sentences and memorized scripts from favorite movies or video games. Initiations to peers often consisted of inappropriate facial expressions and verbal perseverations. John's word identification skills were at the 1.4 grade level on the WRMT-R, and he comprehended short written sentences.

Casey (age 6 years 6 months) was integrated for approximately 30% of the day in a regular first-grade classroom. He had been diagnosed with autism and scored in the mild to moderate range of autism on the CARS. Casey had characteristics of hyperlexia, above-average decoding skills, and normal nonverbal intelligence. His verbal repertoire consisted of echolalic utterances with some spontaneous phrases directed mainly to adults. Initiations to peers were rare.

Ivan (age 12 years 2 months) was fully integrated in second grade, except for resource support for reading and math. No diagnosis had been made at the time of this study. On the CARS, he scored in the mild to moderate range of autism. Socially, he avoided interacting with peers but communicated with adults on topics of personal interest (e.g., favorite movies, weather). Ivan's word-identification skills were at the 1.5 grade level on the WRMT-R, and he could read and comprehend short sentences.

The 10 typical peers were identified and recommended by each focus child's regular classroom teacher. Teachers were asked to recommend children who (a) did not show social communication difficulties, (b) could provide appropriate and positive social models, and (c) consistently completed their work so they could leave the classroom twice per week to participate. The same peers participated as conversational partners throughout the study. Mixed genders (i.e., 1 girl and 1 boy without disabilities) were in each triad except for one (all boys in Greg's group).

Settings and Sessions

All of the sessions took place in a media room (8 m by 5 m) in the school library. Each triad came to the media room separately. During baseline, each triad attended two 10-min sessions per week. Once a group started treatment, they attended two 30-min treatment sessions per week. Each treatment session consisted of (a) 10 min of systematic instruction (i.e., social story instruction, written text cue rehearsal, role play), (b) 10 min of engagement in a social activity, and (c) 10 min of self-evaluation using video feedback. All interactions took place at a crescent-shaped table in the media room. Session and activity agendas and an adapted clock (i.e., red section decreased as time de-

creased) were used to assist with knowledge of task expectations and transitions. Total number of sessions ranged from 30 to 38 over a period of 15 to 19 weeks.

Dependent Measures and Data Collection

All experimental sessions were audio and videotaped. The videocamera was located near the participants, at a distance that did not interfere with the interaction. A second cassette recorder was positioned on the videocamera and played a prerecorded audible 15-s interval tape for 10 min. A direct observation coding system was used to code the frequency of occurrence of all appropriate and inappropriate social communication measures for the students with social impairments. Social communication behaviors were coded live by one of two trained research assistants during the 10-min social activity in 15-s intervals to assist with interobserver agreement calculations. Thus, within each 15-s interval recording, observers coded the occurrence of any of the four appropriate and four inappropriate social language measures (see Table 2). Prior to turning in the coding sheets for analysis, the same observer reviewed the audio and videotape after each session, making corrections as necessary. Reviewing the videotapes permitted closer observation of nonverbal communicative behaviors (e.g., head nod or head shake to respond).

The four primary dependent social measures were contingent responses, securing attention, initiating comments, and initiating requests (see Brinton & Fujiki, 1984; Loveland, Landry, Hughes, Hall, & McEvoy, 1988; Mentis, 1994; Prutting & Kirchner, 1987; Stone & Caro-Martinez, 1990). Other measures were frequency of inappropriate discourse skills such as topic changes, unintelligible responses, other, and no responses (see Table 2).

In addition, the investigators measured collateral effects of the treatment package on the focus children's topic maintenance skills. Data on the children's average number of sequential verbal utterances per conversational episode were collected over a sample of pre- and posttreatment sessions. A 3-s pause or change in topic signaled the end of one conversational episode. Average length of multiple turns per conversational episode was calculated by adding the total number of sequential utterances related to the same topic (initiated by focus child or peer) expressed in one 10-min coding interval, and dividing by the total number of conversational episodes. These data were collected and averaged over the last five baseline sessions (just prior to initiation of treatment of the first social skill) and the last five treatment sessions for each child.

Experimental Design

A multiple baseline design across two to three social communication skills replicated across five triads was used to assess changes in social communication skills of the focus participants. The possible pool of targeted social communication skills were (a) securing attention, (b) initiating comments, (c) initiating requests, and (d) contingent responses. For each participant, two or three social communication skills were targeted for treatment. The discourse skills taught were counterbalanced among the triads.

Procedure

Baseline

During baseline, each triad engaged in one 10-min social activity per session. A rotation of three types of social activities centered on (a) thematic or pretend play (e.g., restaurant or grocery store), (b) board games, and (c) art or science projects. A minimum of five different activities for each type of social play was used. Social activities selected were based on current classroom curricular topics, familiar routines, or child

Table 2
Definitions for Appropriate and Inappropriate Social Language Measures

Social skills	Description
Appropriate	
Contingent response (CR)	Coded if the focus child's utterance is contingent on a peer's immediate prior utterance, within a 2-s interval following the peer's utterance, through (a) acknowledging (e.g., "hmm") or direct or partial repetition of the utterance, (b) agreeing (e.g., head nod, "yeah"), (c) answering peer's question, (d) responding with a related comment about observable objects or events within the ongoing activity, (e) confirming or clarifying a question or comment from the peer (e.g., "What did you say?").
Securing attention (SA)	Coded if the focus child (a) requests attention or acknowledgment from peers (e.g., "Hey!" "See this?" or "Look."), (b) calls the peer's name to gain attention, or (c) uses gestures or vocalizations to establish joint attention with the peer (e.g., taps on shoulder, hold an object up to show peers).
Initiating comments (IC)	Descriptive comments that are related to the ongoing topic or event, but not contingent on a peer's prior utterance and not used to request information, and the focus child (a) provides a comment following a 3-s interval after a peer's last utterance, (b) initiates a new idea or topic that relates to the ongoing joint activity or topic but is not a request, (c) compliments the peer (e.g., "You did it!") or himself, (d) reinforces the peer for winning, (e) expresses enjoyment to the peer regarding their interaction together (e.g., "This is fun!"). The child's utterance was coded as IC if it met the criteria of (b) to (e) within the 3-s interval.
Initiating requests (IR)	Coded if focus child's utterance is related to the ongoing topic or event, but not contingent on a peer's prior utterance and not used to clarify something the peer said (would be CR), and the focus child requests information or actions following a 3-s interval after a peer's last utterance.
Inappropriate	
Topic change (TC)	Coded with or without a change in materials or games if the focus child (a) interrupts (definite overlap of words) a peer to introduce a new topic that has not been discussed previously or to reintroduce a previous topic, (b) changes the topic to something unrelated to and noncontingent on the peer's prior utterance, (c) comments tangential to some aspect of the peer's previous utterance but there is an ambiguous semantic referent not immediately recognizable. Verbal turns that follow a TC are coded as CR, IC, IR or SA if the conversation follows the changed or shifted topic.
Unintelligible (UN)	Utterances that are not interpretable or are unintelligible to the coder after listening to the audiotape a minimum of three times.
Other (OT)	Any (a) animal noises or other vocalizations, (b) stereotypic or perseverative utterances (considered perseverative on the third utterance; if another child speaks or the child continues the perseveration at a later time, start over and code the first two utterances as they are defined, (c) delayed echolalia that is noninteractive.
No response (NR)	Child does not respond verbally or nonverbally within 3-s to (a) a peer's request for information, requests for actions, or protests; (b) if the child is performing an action requested by the peer that takes longer than 3-s, wait to see if he completes the task and give him credit if he does, or (c) if the peer asks the same question again within the 3-s interval, the utterance is not coded, and the time frame starts at 0 after the peer's second question. If the child does not respond after the peer repeats himself two or more times, code as NR.

preferences whenever possible. To determine child familiarity and preferences, parents were given a checklist of 10 examples of activities for each of the three categories and asked to check the top five choices their child was most familiar with and would enjoy doing while interacting with peers. Selected social activities had unifying themes, predictable turn-taking sequences, and exchangeable participant roles.

Prior to starting a baseline session, the examiner and children read the session agenda and discussed rules and tasks for the activity. Once the children understood how to independently perform the activity, the timer was set for 10 min and the examiner left the table. No adult interactions with children occurred during the baseline sessions. Once treatment began on the first target social communication skill (securing attention), baseline measurement continued for the other three social communication measures. When treatment was initiated for the second social skill (initiating comments), maintenance data were collected on the first social skill (securing attention), and baseline data continued to be collected for the other two social skills (initiating requests and contingent responses).

Peer Orientation

After baseline, the 2 peers without disabilities from each group met with the primary investigator (one group at one time) for one 30- to 45-min orientation session before the treatment sessions began. Each peer was given a notebook titled "How You Can Talk to Your Friends," with the following four skills listed: (a) "Get your friend's attention before you start talking to them," (b) "Talk to your friends about what you are doing," (c) "Ask questions and answer your friend's questions," and (d) "Take turns, decide on rules, and solve problems together." Under each of these sentences was one hand-drawn picture of two children interacting with topic bubbles (as in cartoons) above their heads (see Figure 1). The peers read the sentence for each skill, talked about why the skill might be important, and then generated and wrote (in a topic bubble) an example of an appropriate social utterance that matched the skill. Finally, peers were told they would receive prizes (e.g., stickers, toys) for remembering how to talk to new friends.

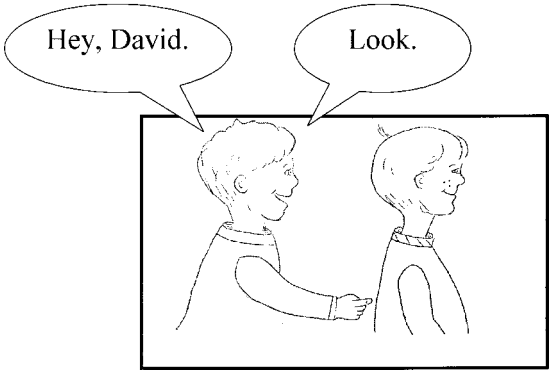

Figure 1. Example of pictorial and written text cues used to teach the social communication skill of securing attention, referred to as "getting friends to look."

Treatment

Direct social skills instruction was provided to each focus child in the context of the triad (i.e., peers present). Treatment sessions were 30 min in length and occurred twice per week for each triad. The 30 min intervention session consisted of 10 min of instruction using the visual stimuli, 10 min of social interaction, and 10 min of video feedback.

Instruction using social stories, text cues, and pictures of social skills. Four social stories (Gray & Garand, 1993) were written to describe the four primary social skills targeted during treatment. The content of the social stories included (a) securing attention (i.e., "getting friends to look") (see Table 3), (b) initiating comments (i.e., "start talking to my friends"), (c) initiating requests (i.e., "ask my friends questions"), and (d) contingent

Table 3
Social Story Stimuli

Example social story: "Getting Friends to Look"
Friends like playing with different toys and games.
Friends like to show each other what they are doing.
Sometimes a friend calls my name and says "look."
This means they want to show me something, and they like it if I look.
I can try to call my friend's name or say "look" to show them what I am doing.
Comprehension questions for social story: "Getting Friends to Look"
What can friends show each other?
Do friends say your name to get you to look at them?
If a friend calls your name, what should you do?
Do they like it if you don't look at them?
What can you say to get your friends to look at you?

responses (i.e., "keep talking to my friends"). The social stories were written according to Gray's (1995) rules for including descriptive, perspective, and directive sentences. For John, Ivan, and Dan, a hand-drawn colored picture depicting two children performing the target social skill was placed at the bottom of the story, along with two empty topic bubbles above the children's heads. For example, the skill "securing attention" had a picture of one child tapping another child on the shoulder (see Figure 1). To assist in comprehension of social expectations, photographs of Casey and Greg and their peers were placed under their social stories, with topic bubbles drawn above their heads.

During the 10-min instructional period, the focus child read one social story targeting one social skill, and was asked four or five simple interrogative and wh– questions to assess his comprehension of the story content (see Table 3). The examiner and peers listened and provided assistance in reading the sentences and answering the comprehension questions, if necessary. Once the focus child was 75% to 80% accurate in answering the social story comprehension questions, the examiner presented the materials for the activity and explained the rules and tasks. She then showed all the children the text cue card. On this card was the hand-drawn picture of the two children (or the individual photographs of Casey or Greg) performing the target social skill. Two to three utterances appropriate to the target social skill and matched to the upcoming activity were written in separate topic bubbles and were attached to the text cue card. For example, to teach the skill "secures attention," words such as "look," "watch this," or a child's name were written in the topic bubbles. The written text cues varied from sentence starters (e.g., "Can I —?" to initiate a request), to one- to three-word phrases or simple sentences. The focus child rehearsed the utterances on the cue card three or more times through reading aloud, role play (i.e., practice using props from upcoming activity), and reading again. To provide access to all written cues throughout the social activity, the social story was placed on a flip chart in the direct line of vision of the focus child and the cue card was left on the table next to him. The examiner then told the children to try to remember the story and to begin using the target skill (e.g., "get a friend to look") while they play. Parents were given a copy of each social story as it was introduced to read daily with their child at home, and were asked to monitor daily reading of the story through completion of weekly checklists.

10-min social interaction. During the 10-min social activity, the examiner remained at a distance from the group. If the focus child did not spontaneously use the target social skill (i.e., read the text cue or generated a new example) at least once per minute, the examiner provided a visual (or, if necessary, verbal) prompt by pointing to one of the written text cues. If the focus child did express the target skill within the 1-min interval, prompts were not provided. Due to a high level of adult dependency observed during the first few sessions, Casey's peers were taught how to prompt him to use the written text cues. For all triads, only the chil-

dren with social impairments (not the peers) received adult prompts to perform the target social skill.

Videotaped feedback. Immediately after the 10-min social activity, the examiner taped the picture of the social skill and written text cues (topic bubbles) on the bottom of a television. All the children in the triad sat in chairs in front of the television. Each child had a clipboard with the target social skill written at the top of a sheet of paper (e.g., "I started talking" for initiating comments). The paper also had two columns marked "yes" circled in green and "no" circled in red with a line crossed through it. The examiner played the videotape of the interaction, paused it after one conversational exchange, and asked the children if they heard examples of the targeted social skill. The tape was initially paused after correct peer models, and the peers and the focus child evaluated the one individual's performance. The examiner then paused the tape after the focus child demonstrated the skill and asked all group members to evaluate his performance. The tape was paused a minimum of three times. If the focus child had not demonstrated the target behavior during the video playback, peer modeling and discussion with the focus child occurred. Checks were exchanged for tickets that were used to obtain small toys or other rewards.

Treatment modifications. For John and Casey treatment was modified for the final five or six sessions because of reduced occurrences of previously targeted social skills. The previously targeted social skills (i.e., initiating comments and requests, securing attention, contingent responses) were combined into one social story and represented on a larger cue card by the original social skill pictures (John) or photographs (Casey). One social phrase for each target social skill was written in separate topic bubbles and attached to the cue card. Thus, there were three possible social skills and three possible written cues that the children could choose to express in the social activity. Social story instruction and rehearsal procedures were the same as in earlier treatment sessions. Videotaped feedback forms were modified to allow self-evaluation and feedback on all three social skills at one time. That is, all three skills were listed on the sheet of paper, with two columns (for "yes" or "no") under each skill.

Slight modifications in the primary treatment procedures were implemented solely for Ivan. During the first seven treatment sessions, Ivan often became frustrated when asked to read the social story or written text cues aloud. Further, he also appeared to be upset about being singled out from his peers during the instruction time. Thus, the treatment procedures were modified slightly in the following manner: (a) Ivan and his peers took turns reading the social story aloud, (b) Ivan and his peers took turns rehearsing the written text cues, and (c) a written text cue was placed in front of each child during the social interaction. Video feedback procedures did not change.

Maintenance

During treatment of the second social communication skill, maintenance data were collected for the first social skill, and baseline data collection continued for the other two potential social skill targets. Similarly, during treatment of a third social skill, maintenance measures were collected on the first two social skills treated. Data-collection procedures were the same as baseline.

Generalization Probes

Generalization probes were conducted in the classroom for Greg, John, and Casey for 3 or 4 days. In the classroom, social story instruction and videotaped feedback were omitted from the procedures. The focus children read the written text cues (social phrases) once prior to engaging in an

Table 4
Social Validity Questionnaire Completed by Teachers and Graduate Students Pre- and Posttreatment

Rate target child's social interaction behaviors (in comparison to typical peers):
1. Target child attends to, and is actively and appropriately involved in, the activity with his friends.
2. Target child starts talking about the activity with appropriate comments or questions.
3. Target child responds to his friends' comments.
Rate typical peers' social interaction behaviors with target child:
4. Friends attend to and attempt to draw the target child into the activity or interaction.
5. Friends respond to the target child's verbal and nonverbal (e.g., gestures, actions) communication.
6. Friends start talking (e.g., ask questions, say comments) to the target child.

Note. Each question was rated on a scale of 1 to 5, with 1 = *not at all*, 2 = *much less than average for age group*, 3 = *somewhat less than average*, 4 = *average for age group*, and 5 = *better than average*.

already-scheduled 10-min activity with the same peers. Classroom activities were predetermined by the regular education teacher, and included reading "big books," working on computers, completing math worksheets, or doing art projects.

Social Validity

Seven regular education teachers and six graduate students in speech-language pathology who were unfamiliar with the purpose of the study provided subjective ratings of changes in social interactions between the children with social impairments and their peers. For each triad, 2-min vignettes of social interactions before and after treatment were recorded on a separate videotape. The order of presentation of the pre- and posttreatment sessions recorded on this videotape were random, and were presented blind to the raters. The 13 judges independently rated specific social behaviors for the focus children and their peers by completing a 5-point Likert-type scale (i.e., 1 = *not at all,* 3 = *somewhat less than average,* 5 = *better than average*) for six questions (see Table 4). Questions 1 through 3 targeted the focus child's social behaviors towards their peers, and Questions 4 through 6 targeted the peer's social behaviors toward the focus children.

Interobserver Agreement

Prior to baseline data collection, two coders were trained to a criterion level of 80% interobserver agreement. After the primary coder (a master's level student in communication disorders) reviewed the audio and videotapes of each session, a secondary coder (a doctoral student in communication disorders) independently reviewed the audio and videotapes of 30% of all experimental sessions. Using the final coding sheets, an agreement was scored if both observers coded the occurrence of the specific social communication behaviors within the same interval (±5 s). Disagreements were scored if the coders did not agree on the type of social behavior or if one coder did not observe the behavior. Percentages of interobserver agreement were then calculated by dividing the number of agreements by the sum of agreements plus disagreements and multiplying by 100%. Interobserver agreement was consistently above 80% for all participants. Agreement ranged from 87% to 100% for Dan (M = 92%), 81% to 94% for Greg (M = 89%), 80% to 100% for John (M = 92%), 83% to 100% for Casey (M = 93%), and 84% to 95% for Ivan (M = 90%). Treatment fidelity was monitored for 20% of the treatment sessions using a checklist of the treatment procedures. Mean treatment fidelity was 89% (range, 82% to 100%).

RESULTS

Focus Children's Social Communication Progress

Frequencies of targeted social language skills and adult prompts during the 10-min

social interaction for the focus children are presented in Figures 2 through 6. Also included are data showing the frequency of untreated social communication skills for Dan and Ivan and changes in inappropriate social behaviors for Greg, John, and Casey. Dan and Ivan emitted low levels of inappropriate social behaviors.

Dan demonstrated few attention-securing behaviors during baseline, with an average of 0.5 per session (see Figure 2). Following treatment, Dan increased his attempts to secure a peer's attention to an average of 6.7 per session (unprompted). During treatment on the next social skill (initiating comments), improvements in securing attention declined to an average of 4.6 per session in the absence of text cues and prompts, but were still maintained above baseline levels. The treatment was effective in doubling Dan's frequency of comments from an average of 6.5 to 16.4 per session, with progress being maintained (M = 19) in the absence of prompts. His frequency of initiating requests improved to an average of 11 per session (compared to a mean of 3.1 in baseline) once treatment began on the first behavior targeted (securing attention). This rate of requesting continued during treatment on initiating comments. Once treatment began on initiating requests, Dan increased his unprompted requests to peers from an average of 7.3 in baseline to 19.3 per session. Contingent responses were not targeted in treatment, because this social skill steadily improved over the course of intervention.

With the exception of Session 10, Greg engaged in low rates of securing attention during baseline, with an average of 5.2 per session (see Figure 3). Following treatment, he increased this behavior to 9.9 per session. These improvements were maintained as text cues and prompts were faded in treatment. Although Greg's securing attention without text cues during treatment of the next social skill (initiating comments) was variable, his average performance (M = 10.3) was above baseline. Greg's baseline data revealed an average of 7.8 comments per session, with a higher number of comments emitted during a number of sessions that involved playing a board game. The treatment resulted in an increase in comments to 12.6 per session and more stable performance across different social activities (i.e., thematic play and art or science projects). These improvements continued as prompts were faded, with an average of 27.8 comments emitted per maintenance session. Treatment on initiating requests resulted in an increase from an average of 6.6 requests during baseline to 20.3 per session. Generalization data revealed no clear transfer of improved target behaviors to the modified classroom activities. Overall, Greg's average rate of inappropriate social behaviors decreased by almost 50% after treatment was implemented on the first social skill (i.e., Sessions 15 to 37; M = 8 per session) compared to baseline (M = 15 per session).

Due to low baseline performance of initiations, the behaviors of initiating comments and initiating requests were combined into one category for John and Casey and were targeted simultaneously. The data presented in Figures 4 and 5 (initiating comments and requests) reflect occurrences of both of these social communication behaviors. Immediate treatment effects were observed for John for initiations and securing attention (see Figure 4). Specifically, he increased his initiations from an average of 13.3 per baseline session to 19 per session. His average rates of securing attention increased from 3.9 in baseline to 5.8 per session. During maintenance, John initially continued to comment and make requests to peers, as verbal prompts were faded, with an average rate overall of 21.2 per session. However, changing to treatment on a new social skill resulted in a reduction in initia-

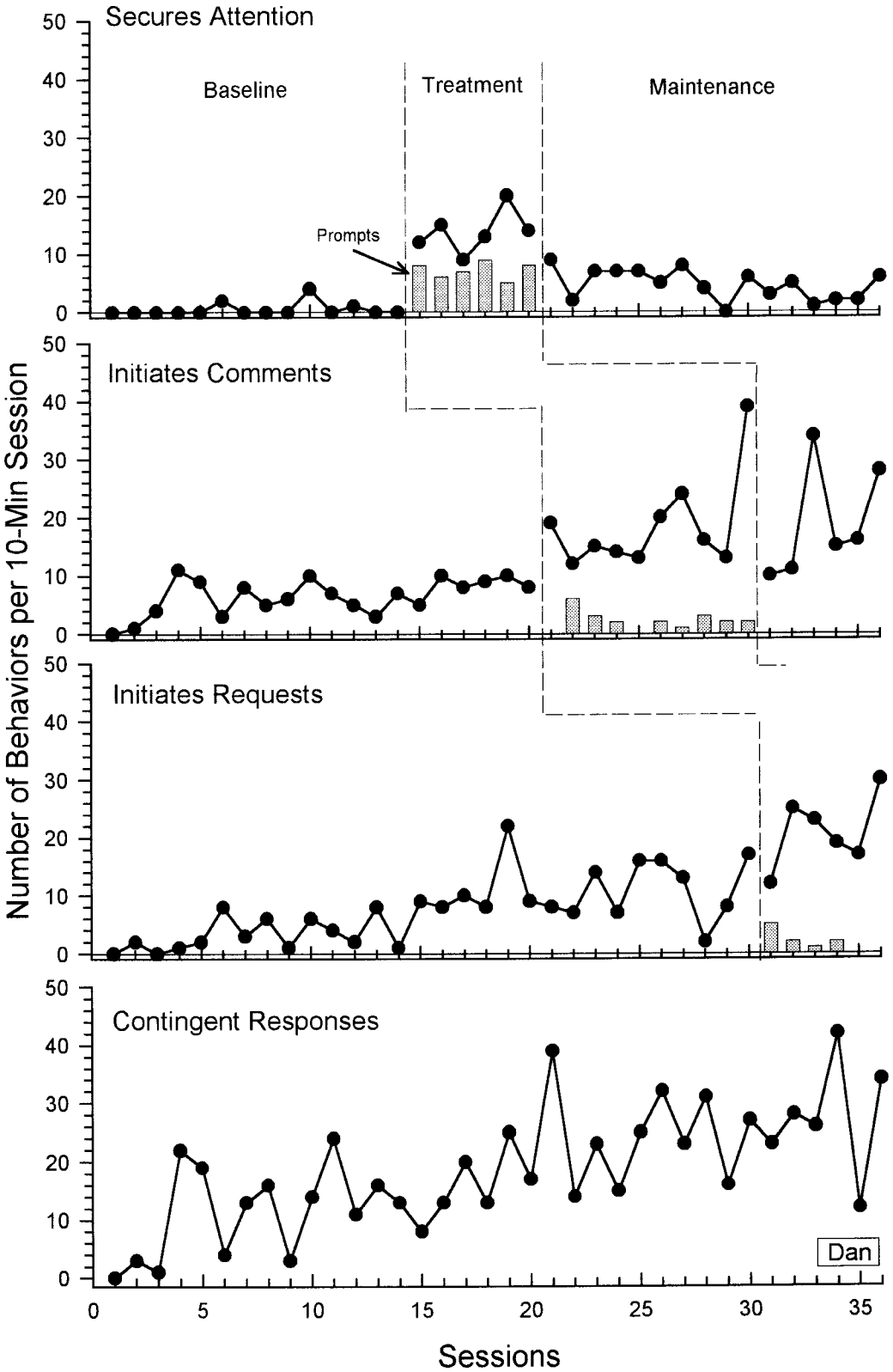

Figure 2. Frequency of appropriate social communication skills during baseline, treatment, and maintenance conditions for Dan during 10-min sessions.

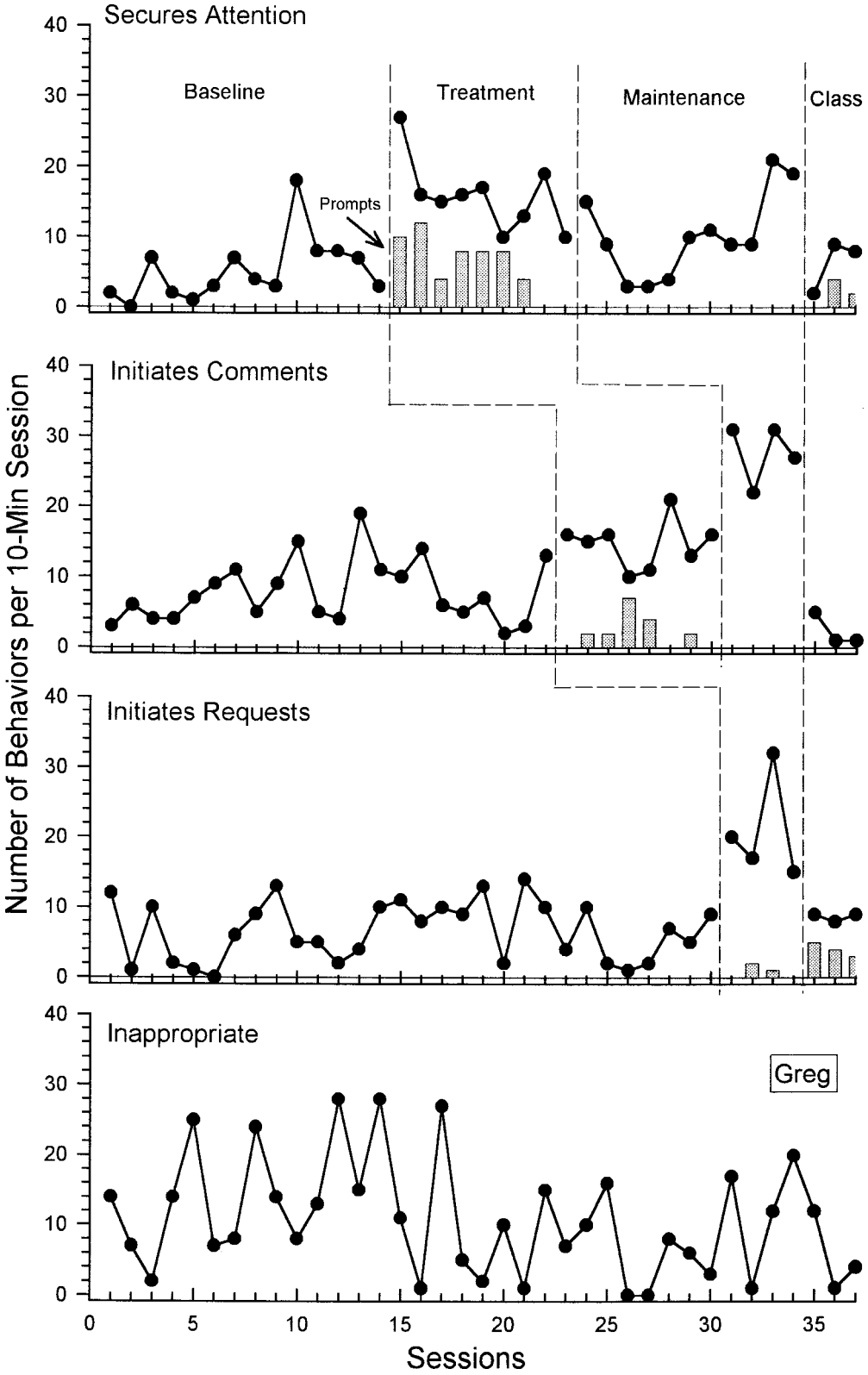

Figure 3. Frequency of coded social communication skills during baseline, treatment, maintenance, and classroom conditions for Greg during 10-min sessions.

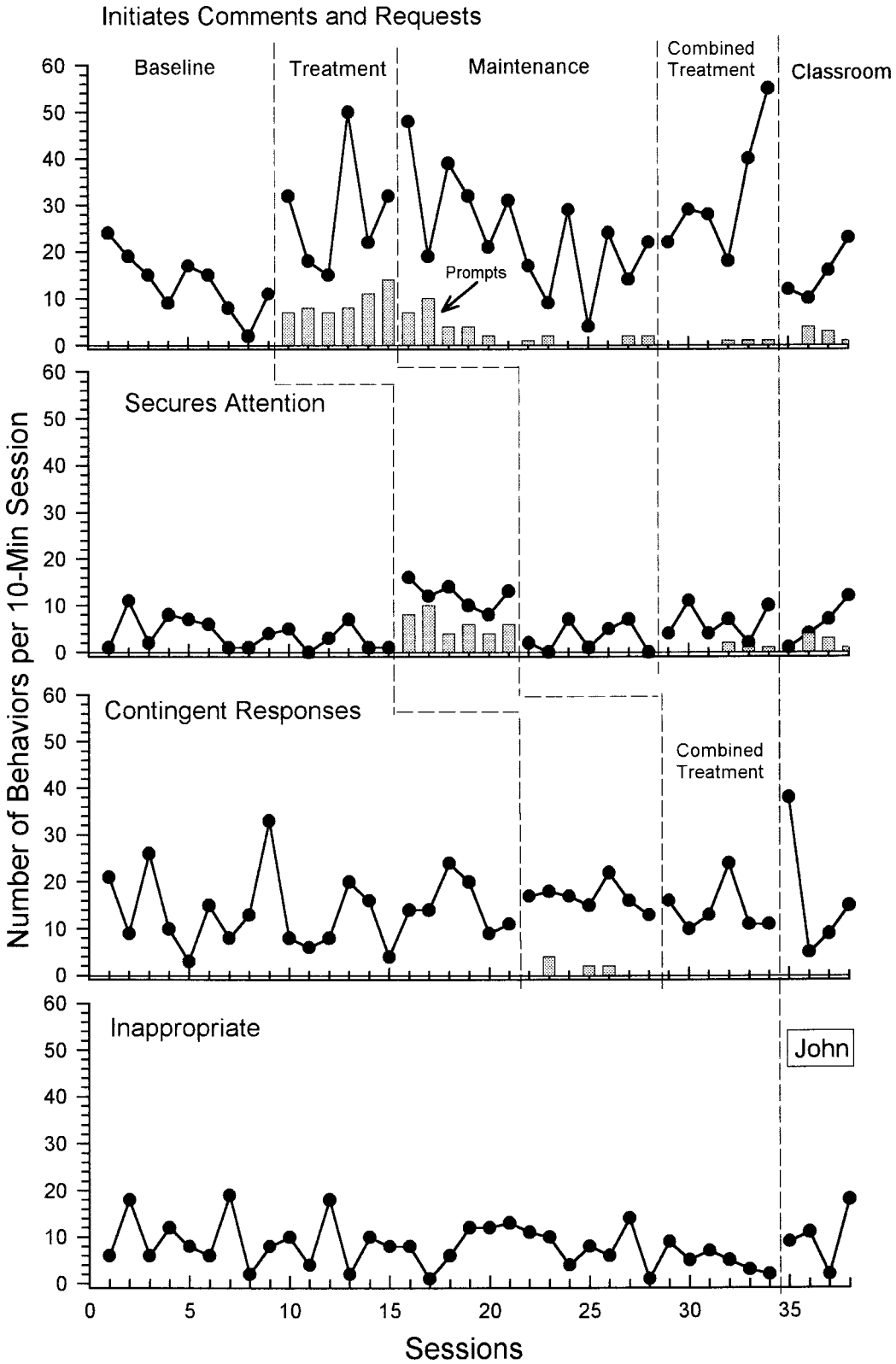

Figure 4. Frequency of coded social communication skills during baseline, treatment, maintenance, and classroom conditions for John during 10-min sessions.

tions, especially securing attention (M = 3.1 per session) during maintenance. During the combined treatment condition (i.e., instruction and text cues used for all three previously targeted skills) or booster sessions, John's average initiations improved to 31.3 per session, a rate higher than initial treatment levels. Securing attention recovered to 5.7 per session, which was similar to initial treatment levels. John's contingent responses to peers were highly variable during baseline, ranging from 3 to 33 per session (M = 13.9). Treatment was effective in stabilizing his performance on this social skill. His responses to peers in treatment ranged from 13 to 20 (M = 15.7). Generalized improvements in the classroom were not observed for initiations and securing attention (M = 13.3 and 4.0 per session, respectively); variability of contingent responses reoccurred during classroom social interactions (M = 16.8; range, 5 to 38).

Casey demonstrated low baseline performance on all targeted social behaviors (see Figure 5). For example, he engaged in an average of 2.7 initiations (both comments and requests) per 10-min activity during baseline. Treatment doubled Casey's unprompted initiations to an average of 6.5 per session. Slight improvements were observed following treatment on securing attention, as adult prompts were faded, with an increase from an average of 0 in baseline to 1.8 per session. Treatment effects for initiations and securing attention were not maintained without text cues or prompts. Once treatment began on contingent responses, Casey increased his answers to peers' questions from 3.6 to 19.6 per session. The combined treatment led to recovered improvements in Casey's unprompted initiations (M = 12.2 per session) and securing attention (M = 2.2 per session). Although a gradual decrease in contingent response behaviors was observed during the combined treatment, Casey's average number of responses to peers (M = 14.6 per session) was higher than baseline. In the classroom, Casey demonstrated some generalization for two of three trained social behaviors. He continued to initiate comments and requests to peers at an average rate of 10.3 per classroom session, and secured attention at a rate of 4.0 per session.

Ivan demonstrated variable initiation of comments during baseline, with an average rate of 8.5 per session (see Figure 6). The frequency of his initiations did not change with the onset of treatment. Following implementation of the modified treatment procedures (Treatment 2), Ivan's frequency of comments steadily increased to an average of 15 per session, and he maintained these improvements at an average of 17.5 per session. The treatment also was effective in improving Ivan's average rates of securing attention, which increased from 2.0 during baseline to 9.3 per session. Baseline data revealed relatively high frequencies of initiating requests and contingent responses; thus, these skills were not targeted.

Multiple-turn interactions. Topic maintenance skills improved for all focus children as reflected in increases in their average number of utterances per conversational episode during a sample of the last five baseline sessions (before treatment on the first social skill) and the last five treatment sessions. For example, Dan's average number of utterances per conversational episode increased from an average of 1.9 in baseline to 3.4 at the end of treatment. Greg's ability to maintain topics improved from an average of 3.8 to 5.1 utterances per episode. John increased his average utterances per episode from 2.4 to 4.1 after treatment. Ivan and Casey doubled their number of utterances to maintain conversational topics, with Casey improving from an average of 0.6 to 2.9 utterances and Ivan improving from 2.4 to 4.9 utterances.

Social Validity Assessment

Judgments of the quantity and quality of changes in specific social behaviors and in-

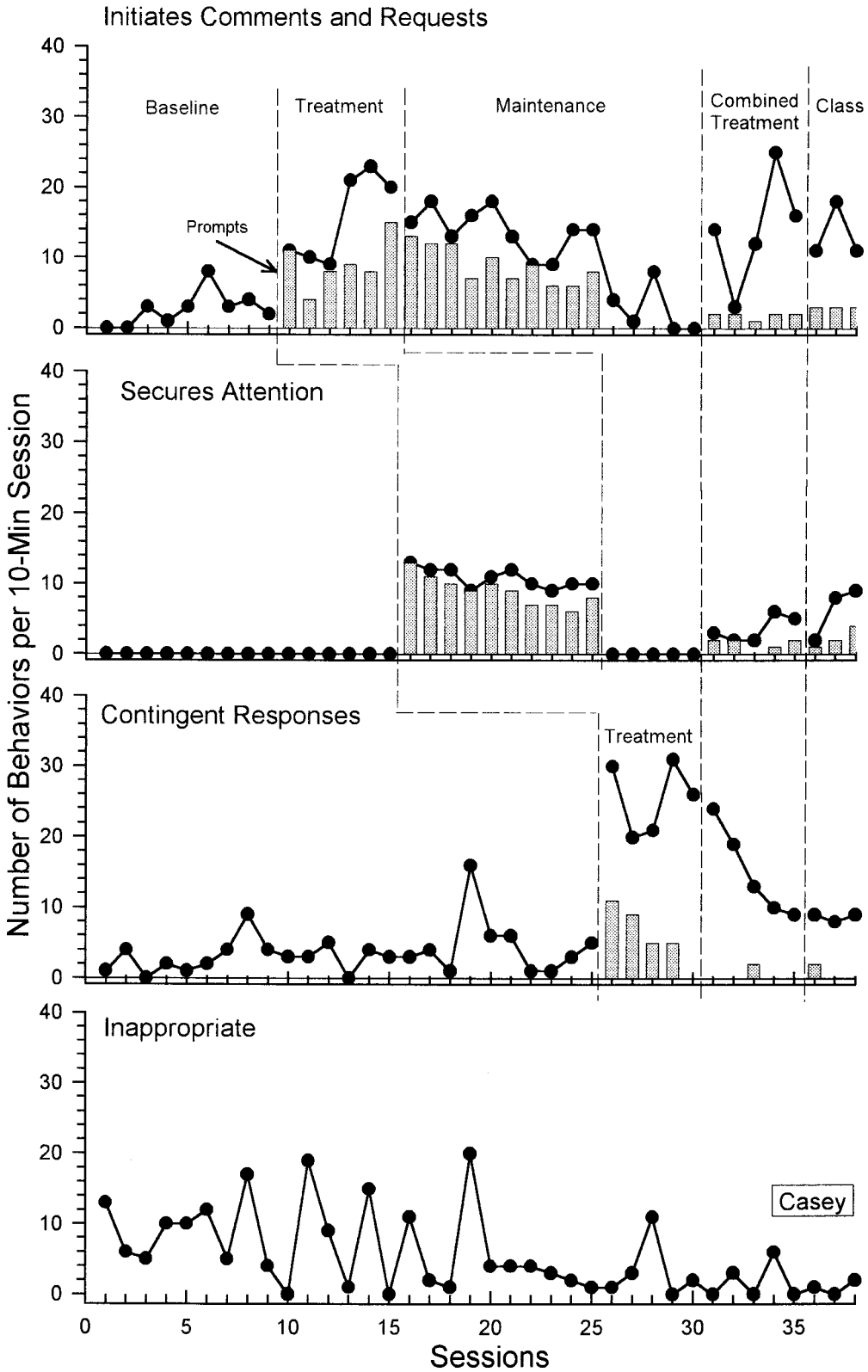

Figure 5. Frequency of coded social communication skills during baseline, treatment, maintenance, and classroom conditions for Casey during 10-min sessions.

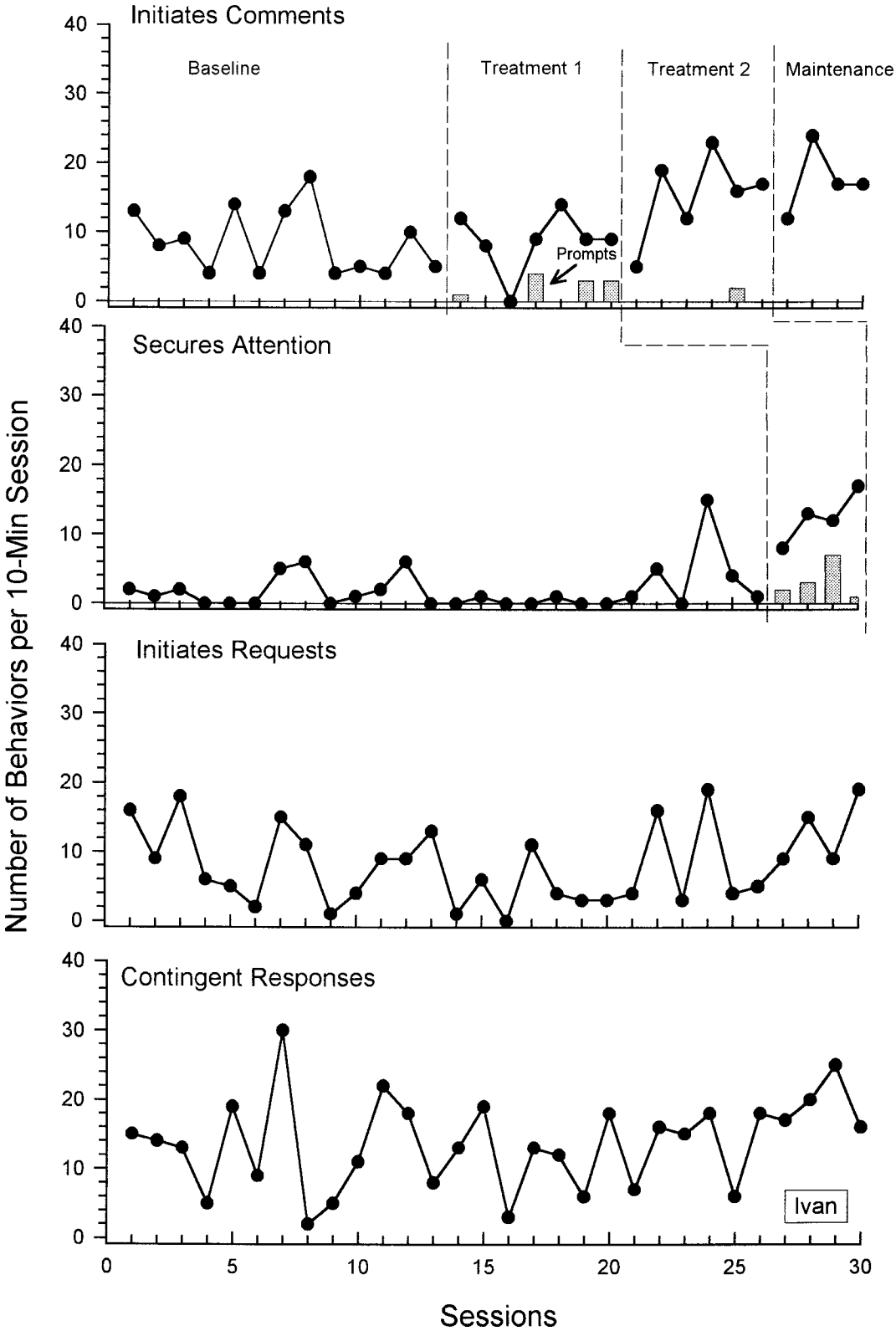

Figure 6. Frequency of appropriate social communication skills during baseline, treatment, and maintenance conditions for Ivan during 10-min sessions.

Table 5
Summary of Teacher and Graduate Student Social Validity Ratings Pre- and Posttreatment

		Teacher ratings				Graduate student ratings			
		Pre		Post		Pre		Post	
Child		*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Dan	TC[a]	2.7	1.8	4.0	1.7	2.3	2.7	3.0	2.0
	P[b]	3.0	3.3	4.7	1.2	2.0	3.5	4.0	1.7
Greg	TC	2.2	3.3	3.7	2.7	2.2	1.5	4.2	0.8
	P	3.6	4.2	4.3	1.5	2.9	3.1	4.1	0.4
John	TC	1.4	1.3	3.3	1.6	1.9	1.2	3.5	1.0
	P	1.8	3.2	3.6	1.1	1.8	1.6	4.0	1.7
Casey	TC	1.7	1.7	3.2	2.2	1.4	0.8	2.7	2.8
	P	2.8	4.0	4.1	1.0	1.6	2.6	3.4	3.0
Ivan	TC	2.0	2.3	4.3	1.3	2.1	1.2	4.1	1.6
	P	1.5	2.3	4.1	0.4	1.2	1.2	3.9	2.2

Note. 1 = *not at all* regarding active involvement in activity, verbal initiations, or responses to peer's comments; 5 = *better than average* engagement in these three social behaviors.
[a] TC = Target child's social behavior ratings.
[b] P = Peer's social behavior ratings.

teractions between the focus children and their peers are presented in Table 5. Following treatment, all 13 raters consistently reported improvements in reciprocal social behaviors between the focus children and their peers. Specifically, ratings of the focus children's active involvement in the interaction, use of comments or questions, and responses to peers' utterances improved from *not at all* or *much less than average for age group* to *somewhat less than average* to *average for age group*. Improvements in the peers' attempts to draw the focus children into the interaction, respond to their communication attempts, and initiate comments or questions also were reported.

DISCUSSION

An intervention that combined social stories, pictorial and written text cues, and supplemental video feedback was effective in increasing specific social communication skills of 5 young students with autism as they interacted with typical peers. Following implementation of the visually mediated treatment, the children with social impairments demonstrated improved and more consistent rates of targeted social behaviors compared to baseline performance. Treatment effects were replicated across four different social behaviors. Experimental control was demonstrated over three targeted social skills by Dan, Greg, and Casey and two social skills for John and Ivan. Although marked increases in John's ability to respond contingently to peers were not observed, he did demonstrate more consistent and relevant responses after treatment. For Ivan, a slight modification in treatment procedures resulted in treatment effects across both social behaviors targeted (initiating comments and securing attention). These findings also demonstrate the importance of individualizing social interventions.

Dan's and Greg's improvements generalized across targeted social behaviors. For example, after being taught how to gain a peer's attention, Dan would add a comment or request (e.g., "Jamie, it's your turn") to give directions, state rules, or ask questions. Greg also demonstrated generalized improvements, in that treatment on initiating requests led to an increase in his use of comments. These generalized treatment effects possibly reflect interrelated social behaviors that underlie initiations.

Casey showed some generalization of skill use during interactions with his peers in the classroom in that he continued to use the written text cues to initiate and maintain their attention. Greg and John did not transfer use of new social language skills to the classroom. In the classroom, there were two main factors that may have contributed to limited generalization. First, the typical peers acted more as tutors with the focus children than was observed in treatment. For example, during the first classroom session, John's peers directed a high number of instructions to assist him in completing a math worksheet to which he frequently responded with frustration. Second, the classroom activities (e.g., reading books, doing worksheets) were different from the social activities used in the study (e.g., board games, thematic play). Improved generalization may have been facilitated by using more socially oriented classroom activities, as has been reported elsewhere (Kamps et al., 1997; Wolfberg & Schuler, 1993).

Overall, maintenance data across participants were not compelling. In the absence of visual cues or as new treatment phases began, 3 of the 5 participants maintained some of the previously targeted social skills. These 3 children maintained improvements in initiating comments to peers, with Dan also maintaining his ability to gain a peer's attention. This general lack of maintenance across targeted social behaviors has important implications. First, the marked or gradual return to baseline performance observed for some participants following removal of adult prompts and visual cues suggests that the visual cues may have been responsible for initial treatment effects. Second, some participants with social impairments may require more intensive treatment to learn certain social communication skills. For example, the extended length of time necessary to effect change in securing attention and the improvements observed following booster treatment sessions indicate that this particular skill may be more difficult for some children with autism. Premature removal of adult- or peer-mediated prompts may lead to loss of treatment gains. Treatment effects may have been more evident and durable had training continued for a longer period, and had prompts been introduced and faded more gradually in the generalization setting. These findings underscore the importance of training new communication skills to a proficient level and creating social opportunities for ongoing practice.

The findings of this investigation contribute in several ways to the treatment efficacy literature for improving communication of children with social deficits related to autism. First, this research documents the potential benefits of using visual supports to teach new social language skills for verbal children who have some reading ability. It is difficult to conclude which visual strategies (social stories, written cues, video feedback) in the treatment package were the most beneficial. Additional research is needed to assess the effectiveness of using social stories that aim to improve social communication or behaviors of children with autism with varied language, cognitive, and social competencies.

Second, by the end of treatment all participants demonstrated improved topic maintenance skills. These collateral improvements are noteworthy given the persistent and significant difficulties reported for this population in using social-communicative behaviors to initiate, respond, and maintain conversations (Lord & Magill-Evans, 1995; Loveland et al., 1988). Similar discourse difficulties have also been reported for high-functioning children with autism who have average intelligence (Ramberg, Ehlers, Nyden, Johansson, & Gillberg, 1996). Other secondary changes included decreased inappropriate social behaviors for some children. These findings are consistent with Koegel and Frea's (1993) research that found treating social behaviors within a similar response class leads to positive changes in untreated

social behaviors, and extend their findings to interactions between elementary students with autism and their peers. Interventions that improve basic conversational skills and decrease inappropriate social behaviors, either directly or indirectly, may lead to more opportunities to participate in day-to-day classroom social interactions and ultimately will help these children to be accepted members of the school social network.

Third, the current study adds to research documenting the effectiveness of using text-based cues to improve social communication behaviors of children with autism (Garrison-Harrell et al., 1997; Kamps et al., 1997). For example, the social validation results confirmed the benefits of using text-based cues to improve reciprocal social interaction behaviors for children with and without social impairments. These findings may assist future social intervention research that seeks to guide social program planning and implementation of effective practices for school-age children with similar communicative and academic profiles.

In summary, this study examined the effects of combining pictorial and written text cues with supplemental video feedback on the social communication of 5 elementary students with social deficits related to autism. A number of previously documented social intervention strategies were effectively combined into one treatment package to improve the children's social communication competence during interactions with typical peers. Capitalizing on the visual modality resulted in higher rates of socially desirable communication skills, lower rates of inappropriate communication behaviors, and improved conversational skills. Together, the results of this study support clinical recommendations for using text-based visual cues to guide the social communication development of children with autism (Quill, 1997; Schuler, 1995) and provide evidence of the benefits of integrating established social intervention techniques.

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Received August 29, 2000
Final acceptance August 20, 2001
Action Editor, Craig H. Kennedy

STUDY QUESTIONS

1. Describe the general context in which the study took place and the types of data that were collected.

2. How were the focus and peer participants selected?

3. The experimental design was described as a multiple baseline design across behaviors (skills). How did the manner in which treatment was implemented create a second experimental design?

4. Describe the three types of instructional interventions used in the study.

5. How was generalization assessed?

6. Summarize the results obtained with respect to the acquisition of target behaviors and maintenance and generalization to untrained skills and new settings.

7. Therapeutic effects were attributed primarily to the antecedent (visual) components of the treatment. What sources of reinforcement may have influenced participants' behavior?

8. The authors noted that increased rate of responding was an index of improvement. Under what conditions would high rates of verbal responding be undesirable?

Questions prepared by Claudia Dozier and Pamela Neidert, The University of Florida