THE DEVELOPMENT OF GENERATIVE SOCIAL COMPREHENSION IN

CHILDREN WITH AUTISM

By

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Abstract

Social comprehension refers to the ability to understand social concepts which entail the interactions between two or more individuals. The present study utilized commercially-available children's books to evaluate the effectiveness of a social comprehension training procedure that utilized multiple exemplars to develop generative social comprehension in children with autism. A multiple probe design across five common childhood social concepts (e.g, sharing) was employed for each of the three children who participated in this study. Probes were conducted on the first presentation of novel books and the proportion of correct responses to the questions was measured. Training on each social concept continued until a generative mastery criterion was met in which the child responded correctly to at least 14 out of 16 questions on three consecutive novel books. The results showed that all of the children were able to answer an increasing proportion of the questions correctly on novel books. However, only 2 of the 3 children were able to meet the generative mastery criterion on 4 out of the 5 social concepts. Generalization probes across untrained in-vivo social scenarios were also assessed. Here, all of the children responded to a high percentage of questions following social comprehension training.

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Thank you to my family who always asks, "How is school going?"

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The Development of Generative Social Comprehension

in Children with Autism

A broad range of language deficits is commonly associated with autism. These deficits are well-established in the defining characteristics of the diagnostic criteria for autism (American Psychiatric Association, 1994). Without specific and often intensive language interventions, children with autism often fail to develop extensive language repertoires comparable to same-aged peers through the natural course of development (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993). Many researchers have developed, investigated, and evaluated numerous strategies for effectively teaching language skills to children with autism (for reviews, see Goldstein, 2002; Hepting & Goldstein, 1996; National Research Council, 2001).

Over the years, through the accumulation of behavior-analytic research findings, comprehensive behavioral intervention programs have been developed and implemented world-wide (National Research Council, 2001, chap. 12). In particular, a portion of this behavior-analytic research has empirically demonstrated that many children with autism can achieve positive outcomes through intensive early behavioral intervention programs (IEBI) (e.g., Howard, Sparkman, Cohen, Green, & Stanislaw, 2005; Lovaas, 1987; Sallows & Graupner, 2005). A common goal in IEBI programs is the establishment of sufficient language skill to succeed in classroom environments.

In the program of intervention of which the present study is a part, a more explicit goal is the establishment of *generative* language learning by accelerating

language development until the child readily generalizes newly learned language and rapidly learns new language concepts while engaged in the everyday activities with others in the natural environment. Generative language refers to the child's production of novel, untrained language responses to an indefinitely large set of naturally occurring discriminative stimulus situations (Goldstein, 1983; Lutzker & Sherman, 1974; Peterson, Larsson, & Riedesel, 2003). A subset of generative language skill is generative *comprehension* in which the child is able to answer novel language comprehension questions about novel stimulus presentations (whether visual or auditory). The process of developing generative language classes is an essential component of IEBI programs; and is needed to promote the development of complex, natural language repertoires in children with autism.

In earlier generative language studies, various language classes were established, primarily through the use of imitation and reinforcement procedures. For example, researchers have established the development of descriptive adjectives in sentences (Hart & Risley, 1968; Martin, 1975); receptive adjectival inflections (i.e., /er/ and /est) (Baer & Guess, 1971); receptive and expressive noun pluralization (Garcia, Guess, & Byrnes, 1973; Guess, Sailor, Rutherford, & Baer; Sailor, 1971); present and past verb inflections (Schumaker & Sherman, 1970); pronouns (Rubin & Stolz, 1974); prepositions (Frisch & Schumaker, 1974); simple and compound sentences (Lutzker & Sherman, 1974; Stevens-Long & Rasmussen, 1974); syntactical forms (Goldstein, 1984); and interrogatives (Twardosz & Baer, 1973). However, in clinical practice, children who succeed in developing earlier types of language skills,

such as those cited above, often continue to require additional language programming to acquire more complex and abstract language skills.

A few treatment studies have investigated more advanced language skills with children with autism, such as question-answering skills (Krantz, Zalenski, Hall, Fenske, and McClannahan 1981). Secan, Egel, and Tilley (1989) investigated the effects of a training strategy to teach children with autism to answer novel "what," "how," and "why" questions about magazine pictures. Each target question form was further divided into subcomponents (e.g., "why relevant to cause/effect," "why relevant to affect," and "why relevant to potential action"). Through modeling and reinforcement procedures, the children with autism acquired generalized responding to the three classes of wh-questions including each subcomponent with novel pictures; however, the children in these studies demonstrated more difficulty responding to "why" questions. Secan et al. concluded that this finding may be due to the number and complexity of visible cues available to the children as referents to correctly answer the questions.

Currently, behavior-analytic research on developing more advanced language comprehension skills is limited. In clinical practice, comprehensive language interventions may progress through a teaching hierarchy that systematically increases the language complexity by advancing from more concrete visual labeling skills to more abstract auditory language comprehension skills. These comprehension skills are often first developed as comprehension questions about visual stimuli, and then comprehension questions about auditory stimuli. A general progression of

comprehension questions may include: (a) detail comprehension; (b) concrete and abstract reasoning; (c) inferential comprehension; and (c) ultimately, social comprehension about social concepts. Detailed descriptions of procedures for establishing the above skills primarily exists in treatment manuals (e.g., Larsson, Riedesel, Keene, & Davis, 2003).

One finding of IEBI research has been limited effectiveness in social skill outcomes for some children who otherwise succeeded (Sallows and Graupner, 2005). For that reason, social comprehension is one skill training program that is being investigated in the present study. Social comprehension refers to a child's ability to understand social concepts which entail the interactions between two or more individuals by accurately responding to language comprehension questions (e.g., "how feel" and "why feel"). Furthermore, generative social comprehension refers to a child's ability to respond to novel language comprehension questions about a social concept within and across various stimulus modes (e.g., books, in vivo social scenarios, movies, etc.). In an extensive literature review, no behavior-analytic research studies were found that examine treatment strategies to develop social comprehension in children with autism.

The present study utilized commercially-available children's books to implement and evaluate the effectiveness of a social comprehension training procedure for developing generative social comprehension in children with autism. This was because many common childhood social concepts are widely emphasized and readily available in children's literature and storybook reading is a natural

language format that children are exposed to in their natural environments (e.g., home and school).

The purpose of this study was (a) to evaluate the effectiveness of a multiple-exemplar strategy in facilitating the acquisition of generative social comprehension of target social concepts and (b) to evaluate the extent of generative responding within and across social concepts and across another stimulus mode (i.e., social scenarios).

Methods

Participants

The participants were three Caucasian male children diagnosed with autism ranging in age from 5-years, 3-months to 8-years, 3-months. Each child had previously received a diagnosis of autism by an independent agency according to the criteria established in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) (APA, 1994). All children were receiving in-home IEBI based on the procedures and program structure developed by Lovaas and his colleagues at the UCLA Clinic for the Behavioral Treatment of Children (e.g., Lovaas et al., 1981). At the onset of this study, all of the children had participated in at least 2 years of treatment. Each child had extensive imitative, receptive, verbal, and social repertoires that were comparable to typically-developing, same-age peers; however, each child demonstrated difficulty responding to questions regarding common social concepts. Table 1 shows the children's chronological age, IQ, and receptive language level.

Table 1

Description of Participants

Child	Age (yr-mo)	Pre-treatment IQ[a]	IQ[a]	Pre-treatment Language[b]	Language[b]
1	6-7	76	94	85	104
2	5-3	65	97	78	101
3	8-3	50	76	59	76

[a]Stanford-Binet Intelligence Scale (5th ed.) (Thorndike, Hagen, & Sattler, 1986)

[b]Peabody Picture Vocabulary Test-IIIA (Dunn & Dunn, 1997)

The children were selected for this study based on the following criteria: (a) each child met the *DSM-IV* criteria for an autism spectrum disorder; (b) each child demonstrated all the identified prerequisite skills; and (c) each child's legal guardians provided written consent for the child's participation in this study. The following prerequisite skills were required to participate in the study: attend to the reading of a 10-minute story, accurately answer wh-questions (i.e., who, what, where, how, and why), and correctly respond to questions when presented with an auditory five-sentence paragraph regarding non-social topics (e.g., getting ready for bed or going grocery shopping).

Experimenters

All experimenters were also behavior therapists for the children in their home-based intervention programs prior to and during the course of this study. The children's mothers also served as experimenters. Prior to this study, each experimenter, behavior therapists and mothers, passed competency-based staff training and met the 31 competencies required to work in the capacity of a behavior therapist (see Appendix A for competency-based staff training checklist). Before the onset of this study, all experimenters were trained on all procedural components through role plays and feedback until each experimenter demonstrated all procedural components on two consecutive assessments. Treatment fidelity was also addressed during the course of this study, typically, through weekly one-hour overlaps with the child's clinic supervisor or senior behavior therapist and weekly team meetings.

Setting

All social comprehension training sessions were conducted in each child's home setting. All children participated in one to two 3-hour therapy sessions per day, five to six days per week. Social comprehension training was implemented as one of the treatment objectives in each child's therapy program. Social comprehension training typically lasted 30 to 45 minutes during each therapy session. All probe and social comprehension training sessions were videotaped.

Materials

For each social concept, a collection of commercially-available, children's books was selected that depicted story characters engaged in a range of activities related to the social concepts (e.g., Big Bird, Franklin, Arthur, Berenstain Bears, etc…). Each book was rated for children 4 to 8 years of age by the publishers (see Appendix B for a bibliography of books for each social concept).

Target Behavior

Social comprehension refers to the ability to understand social concepts which entail the interactions between two or more individuals. For the purpose of this study, social comprehension was operationalized as follows. The target behavior was the proportion of appropriate verbal responses to answer questions on the target social concept on the first presentation of a novel book or social scenario. Five common childhood social concepts were evaluated (i.e., sharing, winning and losing, being bossy, being left out, and determination). A total of 16 questions was asked for each book. Eight specific questions were selected to assess a child's social comprehension

of the target social concepts. These questions were divided into eight types of questions (i.e., "How feel," "What want," "What action," "What should," "Why feel," "Why want," "Why action," and "Why should"). Each specific question (e.g., How feel) was asked two times per book or social scenario. Table 2 shows examples of the questions and appropriate responses for an example book.

Since any question may produce several correct responses, and the intent was to detect generative (i.e. novel) responses, the children's responses were scored as correct if the experimenter judged them to be "reasonable" and "socially appropriate" to the context of the story or social concept by referring to a list of appropriate responses which was included on each data form for each book (see Appendix C data form). The generative mastery criterion for each social concept was that the child responded correctly to 14 out of 16 (88%) questions on the first presentation of three-consecutive novel books.

Design and Procedures

A multiple probe design (Horner & Baer, 1978) across social concepts for each child was used in order to evaluate the effects of social comprehension training. Multiple probes were used to evaluate the generalization of social comprehension to untrained stimuli (i.e., novel books or scenarios). Each child participated in three phases for each social concept: a baseline phase, a social comprehension training phase, and a follow-up phase. For each child, data were collected during four baseline probes, each initial presentation of a novel book or scenario during the social comprehension training phase, and each novel book during the follow-up phase.

Table 2

Examples of Questions and Appropriate Answers for the Book,

Franklin and the Cookies, by Sharon Jennings

Specific Question	Question	Appropriate Responses
How feel	How do Franklin and Bear feel?	Mad Angry
What want	What do Harriet and Beatrice want?	To eat some of Franklin and Bear's cookies They want Franklin and Bear to share their cookies.
What action	What did Franklin and Bear do with the cookies?	Franklin and Bear ate all of the cookies. Franklin and Bear kept eating more cookies.
What should	What should Franklin and Bear do?	Franklin and Bear should share their cookies with their sisters. Franklin and Bear should give some cookies to their sisters.
Why feel	Why do Franklin and Bear feel mad?	Because Franklin and Bear don't want to share their cookies. Because Franklin and Bear want to eat all of the cookies by themselves.
Why want	Why do Harriet and Beatrice want Franklin and Bear to give them some cookies?	Because they don't have any cookies. Because it isn't fair that Franklin and Bear have all of the cookies.
Why action	Why did Franklin and Bear eat all of the cookies?	Because they didn't want to share the cookies with their sisters. Because they wanted to eat all of the cookies.
Why should	Why should Franklin and Bear share the cookies?	Because Franklin and Bear have lots of cookies. Because it is nice to share.

After baseline probes for the first social concept (i.e., sharing) were completed, social comprehension training was implemented for this concept while the other social concepts remained in baseline. Then each concept was implemented in the social comprehension training phase in turn.

Baseline

Four baseline probes were conducted for each child for each target social concept with each of four novel books. A book was judged to be novel if the child had no prior exposure to the book. The experimenter and the child sat side-by-side facing the video camera as the experimenter read the book to the child and after the reading of one or more pages, one of the specific questions (e.g., "How feel") was presented to the child. The child was given 5 seconds to respond. The experimenter either recorded the child's response as correct or incorrect. In order to maintain attention and responding, appropriate on-task behavior was reinforced noncontingently (e.g., attending to experimenter or book). Verbal praise was delivered on approximately every 4th trial whether responses were correct or incorrect and a social activity (e.g., hide-n-seek) was delivered at the end of the probe. Off-task behavior was redirected with a verbal redirect (e.g., saying to the child, "Listen to the story").

Social Comprehension Training

Social comprehension training (SCT) utilized multiple exemplar training (Stokes & Baer, 1977) to promote generative social comprehension within each target social concept. SCT was introduced successively across the legs of the multiple-probe

baseline design after the generative mastery criterion was met for the prior target social concept. If the child did not meet the generative mastery criterion after training on the 8th book, the social concept was terminated.

An initial probe was conducted for the first presentation of a novel book. The same procedures were utilized for these probes as for the baseline probes. The mastery criterion per target book was 14 out of 16 (88%) questions correct on the first opportunity of the session. If the child met the mastery criterion, the next novel book was probed during the next session. If the child answered fewer than 14 out of the 16 questions correct, then SCT was immediately implemented as follows.

SCT was conducted in the same general manner as the probes described above, with the critical difference being the use of verbal prompts, fading, and reinforcement procedures. Following the probe, the experimenter identified the questions that the child did not respond to correctly during the probe. The experimenter selected four of these target questions to train per sitting. If more than four questions needed to be trained, the first four questions were taught to mastery prior to training the next set of questions. Each training session was generally divided up into training "sittings" of four question trials each.

Prior to each training sitting, the experimenter contracted for a reinforcer with the child (e.g., swing, play tag, board game). Then the child was asked to come listen to a story. The experimenter read the page that corresponded with the target question, asked the target question, provided a full or partial verbal prompt, and allowed the child 5 seconds to respond. This procedure was repeated while the experimenter

faded prompts until the experimenter judged that there was a high probability the child could respond independently, then that question was asked without a prompt. Verbal praise was delivered for prompted trials and verbal praise and a token were delivered once the child responded correct to the question independently. After the child accumulated four tokens for correctly answering a series of questions independently, the experimenter delivered the contracted reinforcer. Another contract was established before repeating the above procedures with the other questions that needed to be trained to mastery. Questions about the pictures were randomly interspersed in between prompted trials to ensure attention and accurate responding. Verbal praise was delivered for correct responding to these nontarget questions.

If the child gave an independent response that was correct but was very similar in topography to an earlier response (termed "over-generalized" in the treatment guidelines) (e.g., repeating "Because it is nice to share," or "Because he wants to"), then the experimenter asked the child "What else or why else?" This was to promote response variations to the questions. However, such responses, if correct, were still recorded as a correct trial. Also, if the child repeated an incorrect response, such as, "I don't know." or "What?" the experimenter redirected with, "you need to try by yourself" and re-presented the question to the child. If the child generated a correct response to a redirection, this was also recorded as a correct trial. Each SCT session ended when the child independently answered the target questions. As a result SCT sessions typically lasted 30-45 minutes.

Once the mastery criterion was met with the target book, a probe was conducted on the next novel book. If the child did not meet the mastery criterion on the fourth probe following three SCT training sessions, SCT on that particular book was terminated and an initial probe was conducted on the next book. If the child failed to meet the mastery criterion on the next book during the probe, then social comprehension training started on this book. Additional books were introduced until the child generalized to three- consecutive probes on the 1st presentation of each novel book by correctly responding to 14 out of 16 (88%) questions. Once the child met the generative mastery criterion for the target social concept, social comprehension training began for the next social concept. While social comprehension training continued on the current social concept, follow up probes were implemented to assess further generalization to novel books and response maintenance for the mastered social concepts.

Social Scenarios

To assess generalization of social comprehension training to another stimulus mode, social scenarios in which the child participated in a play activity with another person (e.g., experimenter, parent, sibling, or peer) or observed two other persons engaged in a social interaction during play were assessed during baseline, following SCT, and after follow-up probes were completed. These social scenario probes were designed to determine whether the SCT procedures would promote generalized social comprehension of experiences that might naturally occur while engaged in social interactions with others. Social scenarios were never trained and only served as a

measure of generalization to a novel stimulus mode (see Appendix D for examples of social scenarios). Each social scenario probe was conducted in the identical manner as a baseline probe with a book. Social scenario probes were also conducted during the social comprehension training and follow-up phases. Four social scenario probes were conducted during each phase of this study.

Interobserver Agreement

For all conditions combined, interobserver agreement on the all of the children's verbal responses to questions was obtained for 42% of the first probes of novel books and all social scenario probes. The reliability observer was trained in the definition of correct and incorrect responses. Reliability measures were taken from videotapes of the sessions. Interobserver agreement was calculated by dividing the total number of agreements (each observer recording the same response as correct or incorrect) by the total number of agreements plus disagreements and then multiplying by 100. Interrater agreement averaged 96% (range 94% to 98%) for first probes on novel books and averaged 95% (range 93% to 97%) for social scenarios.

Results

Generative Social Comprehension

Figures 1, 2, and 3 display the percentage of correct responses on questions for each social concept for all initial probes on novel books and all social scenario sets across all conditions of this study. All children demonstrated increases in correct responding to questions on both novel books and social scenarios. Child 1 and Child 2 met the generative mastery criterion for four out of the five social concepts (i.e., 14

Figure 1. Percentage of correct responses on questions for the initial probe on each

novel book and social scenarios across baseline (BL), social comprehension training

(SCT), and follow-up for Child 1.

Figure 2. Percentage of correct responses on questions for the initial probe on each novel book and social scenarios across baseline (BL), social comprehension training (SCT), and follow-up for Child 2.
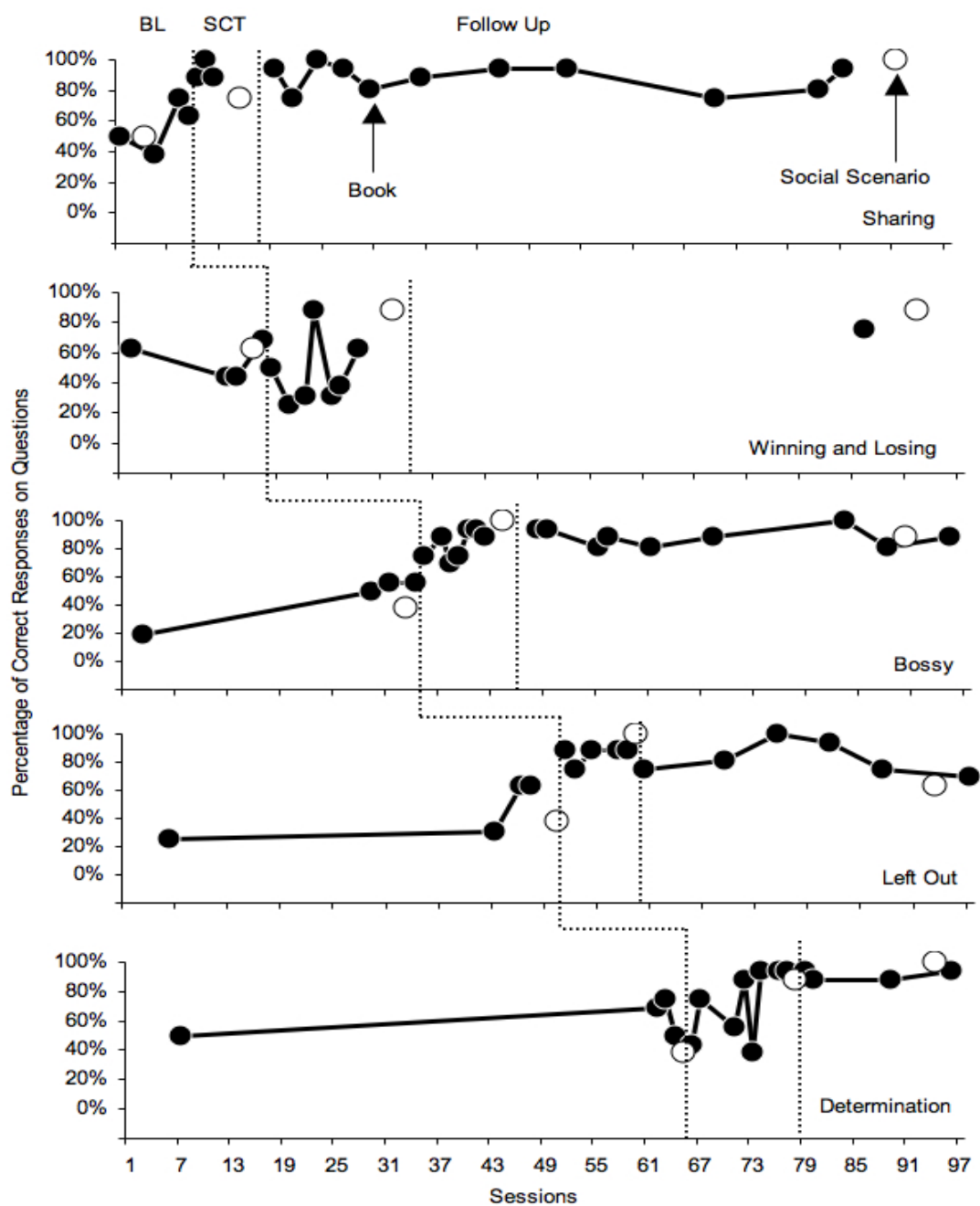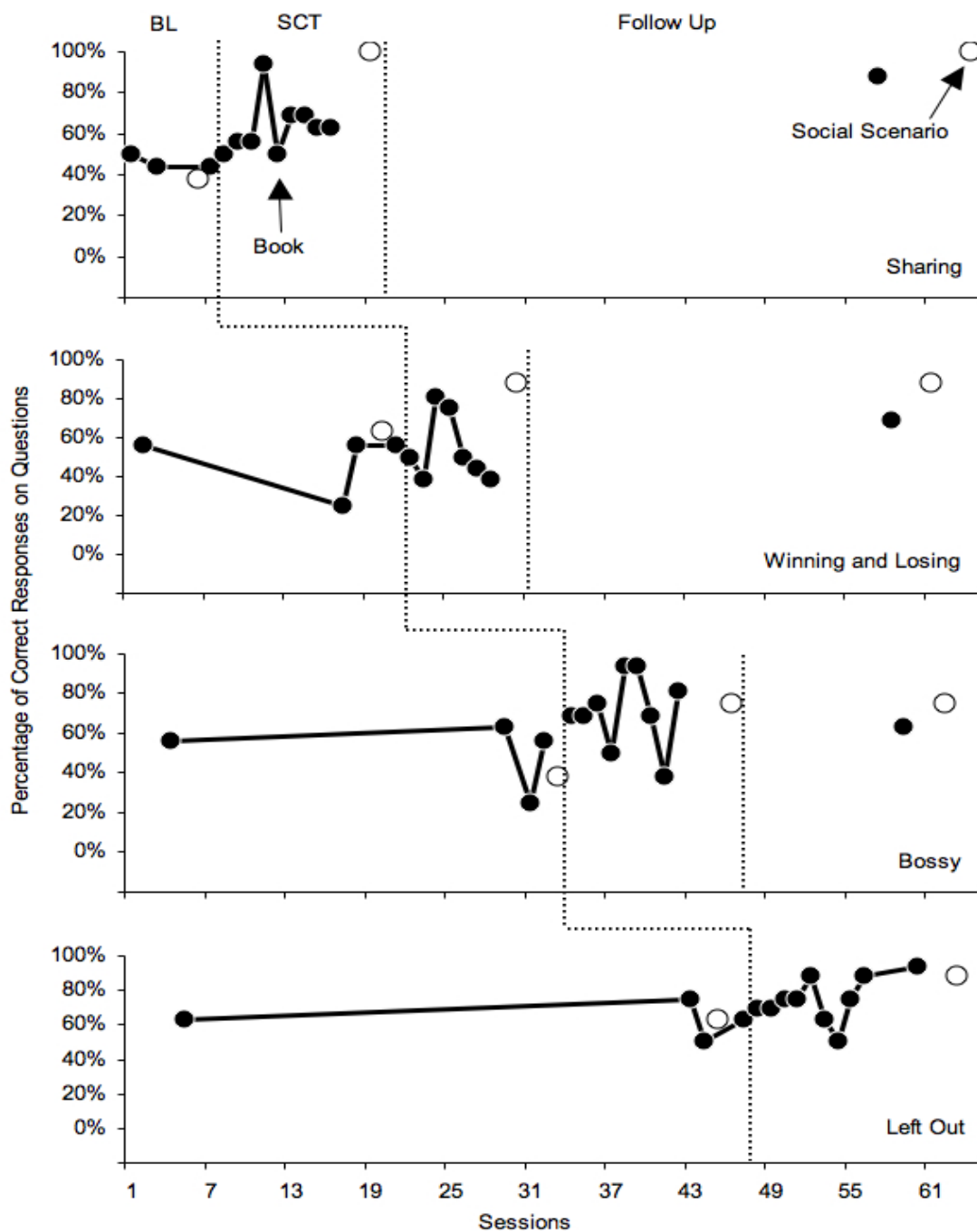
Figure 3. Percentage of correct responses on questions for the initial probe on each

novel book and social scenarios across baseline (BL), social comprehension training
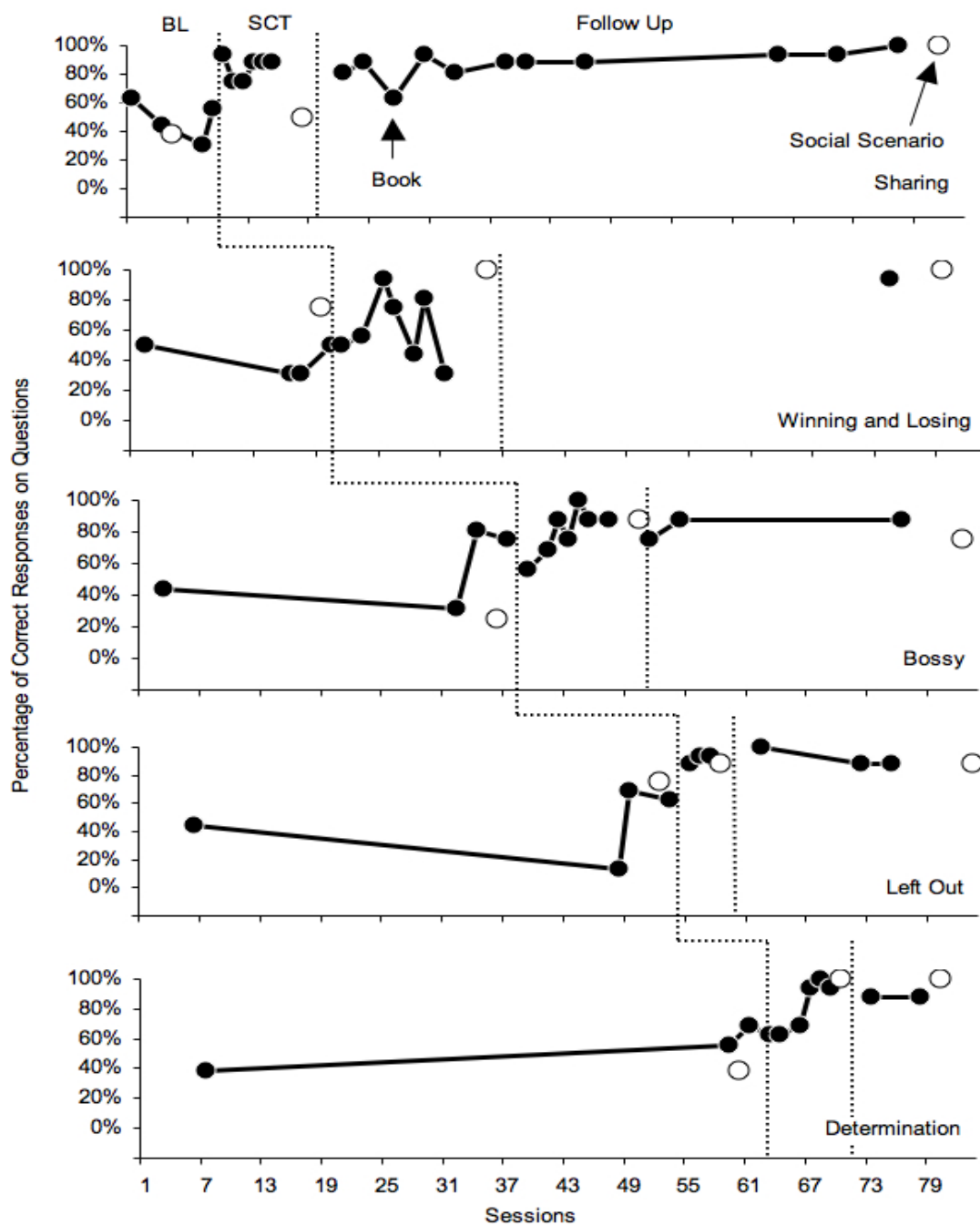
(SCT), and follow-up for Child 3.

out of 16 questions correct on initial probes on three-consecutive novel books). None of the children met the generative mastery criterion on the winning and losing social concept. This social concept was terminated after implementing SCT on seven to eight books for each child. For Child 1 and Child 2, SCT was implemented on one to seven books before meeting the generative mastery criterion for the other social concepts.

Due to time constraints of this study, only four social concepts were implemented for Child 3. He demonstrated increases in responding for all social concepts, but did not respond correctly to 14 out of 16 questions on three-consecutive novel book probes for each social concept. Thus, he did not meet the generative mastery criterion for each social concept. SCT was implemented on eight books prior to terminating training on each social concept. A high-rate of perseverative behavior persisted throughout all conditions of this study for this child. He demonstrated perserverative verbal behavior regarding the characters in the books. Also, he scanned the text for the correct answers to the questions. If the answer was not explicitly stated in the text, he would try to look at the data recording form for the answer. When the experimenter interrupted the child, protesting behavior often occurred. These competing behaviors might have interfered with skill acquisition on the social concepts.

For all social concepts, the mean percentage of book questions answered correctly on initial probes of novel books was 51% (range 49% to 52%) during baseline, 73% (range 69% to 77%) during SCT, and 84% (range 78% to 88%) during

follow-up probes for all of the children. A mean percentage increase of 22% (range 17% to 28%) on correct responding to questions was obtained between baseline and SCT conditions. An additional mean percentage increase of 11% (range 9% to 14%) was obtained on correct responding to questions to novel books between SCT and follow-up. The overall increase in the mean percentage of correct responding to questions on novel books was 33% from baseline to follow-up. See Table 3 for mean percentage of book questions correct on initial probes of novel books for each child.

All of the children demonstrated some stereotyped language errors during all conditions of the study. For example, the children over-generalized their answers when responding to question about a new social concept (e.g., always giving the same correct response, such as "Because it is nice to share" rather than "Because his friend doesn't have any.") and substituted perseverative errors in response to questions about the social concept on acquisition (e.g., "Why does Franklin want to be invited?" "Be it is nice.").

Specific Questions

During baseline probes, all children responded correctly to 81% or more of the how feel questions for all social concepts (Child 1 = 85%; Child 2 =88%; Child 3 = 81%); whereas these children responded correctly to less than 33% of what should questions (Child 1 = 33%; Child 2 = 33%; Child 3 = 28%), less than 41% of why action questions (Child 1 = 30%; Child 2 = 20%; Child 3 = 28%), and less than 47% of why want questions (Child 1 = 43%; Child 2 = 43%; Child 3 = 47%). An overall mean percentage increase of correct responding for why should questions (M = 54%,

Table 3

Mean Percentage Correct for All Questions on Novel Book Probes for Each Social

Concept

Child	Social Concept	Baseline	Condition Treatment	Follow-up
1	Sharing	56	92	88
	Winning and Losing	55	46	75
	Bossy	45	83	88
	Left Out	45	85	82
	Determination	58	73	91
	All	52	73	87
2	Sharing	48	84	87
	Winning and Losing	41	62	94
	Bossy	53	78	88
	Left Out	47	92	92
	Determination	56	84	88
	All	49	77	88
3	Sharing	47	76	88
	Winning and Losing	48	54	69
	Bossy	50	71	63
	Left Out	63	72	94
	All	52	69	78

Note. Each book contained 16 questions. During baseline, probes were conducted on four novel books for each social concept. During social comprehension training and follow-up probes, the number of probes varied for each child based on their performance.

range 47% to 62%), why action questions (M = 47%, range 39% to 56%), and why want questions (M = 26%, range 16% to 33%) was demonstrated between baseline and follow-up probe conditions for all children. Even with the increases on the above specific questions, during follow-up probes, all children continued to demonstrate high rates of incorrect response to why want questions, Child 1 and Child 2 continued to demonstrate a high rate of incorrect responses to why action questions, and Child 3 continue to demonstrate a high rate of incorrect responses to why should questions. See Table 4 mean percentage correct for each specific type of question on novel books for each child.

Social Scenarios

For each social concept, probes were conducted on four social scenarios during each condition. Each specific question was asked one-time during baseline, following SCT, and during follow-up. The mean percentage of correct responses to these questions for all social concepts during baseline was 48% (range 45% to 50%), following SCT was 88% (range 85% to 90%), and during follow up 90% (range 88% to 93%). An overall 42% increase in correct responding was demonstrated from baseline to follow-up probes on novel social scenarios.

During baseline, Child 1 demonstrated the most incorrect responses on why feel, why want, and should questions, Child 2 demonstrated the most incorrect responses on why action question, and Child 3 demonstrated the most incorrect responses on why action, should, and why should questions. An increase in correct responding resulted following SCT on the above questions; however, Child 1 and

Table 4

Mean Percentage Correct For Each Specific Question on Novel Book Probes for All

Social Concepts

Child	Specific Question	Baseline	Condition Treatment	Follow-up
1	Feel	85	88	97
	Why feel	48	80	82
	Want	63	82	92
	Why want	43	57	76
	Action	75	80	90
	Why action	30	50	69
	Should	50	75	95
	Why should	33	68	95
2	Feel	88	98	100
	Why feel	45	72	92
	Want	58	89	92
	Why want	43	69	74
	Action	68	80	92
	Why action	20	72	76
	Should	45	74	88
	Why should	33	67	86
3	Feel	81	88	100
	Why feel	56	58	75
	Want	56	73	88
	Why want	47	73	63
	Action	66	71	88
	Why action	41	52	88
	Should	38	70	50
	Why should	28	65	75

Note. Each book contained 16 questions (two trials for each specific question).

During baseline, probes were conducted on four novel books for each social concept.

During social comprehension training and follow-up probes, the number of probes

varied for each child based on their performance.

Child 2 continued to demonstrate incorrect responding on why action question and Child 3 continued to demonstrate incorrect responding on why action and why should. Child 3 answered an overall higher percentage of questions correctly on social scenarios probes following SCT and during follow up probes than novel books probes. See Tables 5 and 6 for mean percentage correct for all questions and each specific question on social scenario probes for each child.

Generalization Across Social Concepts

Child 1 and Child 2 responded correctly to 15 out 16 questions (94%) on a novel book on a final follow up probe for winning and losing. This final follow up probe occurred following SCT and after meeting the generative social comprehension criterion on the other four social concepts. It is possible the children started to generalize their responding across social concepts. However, there are limited data to support this conclusion.

Table 5

Mean Percentage Correct for All Questions on Social Scenario Probes for

Each Social Concept

			Condition	
Child	Social Concept	Baseline	Treatment	Follow-up
1	Sharing	50	75	100
	Winning and Losing	63	88	88
	Bossy	38	100	88
	Left Out	38	100	63
	Determination	38	88	100
	All	45	90	88
2	Sharing	38	50	100
	Winning and Losing	75	100	100
	Bossy	25	88	75
	Left Out	75	88	88
	Determination	38	100	100
	All	50	85	93
3	Sharing	38	100	100
	Winning and Losing	63	88	88
	Bossy	38	75	75
	Left Out	63	88	---
	All	50	88	88

Note. For each social concept, probes were conducted on four social scenarios

during baseline, social comprehension training, and follow-up probes. Two questions

were asked per social scenario. No follow up data for Child 3 on left out social

concept.

Table 6

Mean Percentage Correct for Each Specific Question on Social Scenario Probes for

All Social Concepts

Child	Specific Question	Baseline	Condition Treatment	Follow-Up
1	Feel	60	100	100
	Why feel	20	80	100
	Want	80	80	80
	Why want	0	80	80
	Action	80	100	80
	Why action	40	80	60
	Should	20	100	100
	Why should	60	100	100
2	Feel	100	100	100
	Why feel	40	80	100
	Want	40	100	100
	Why want	40	60	100
	Action	60	100	100
	Why action	20	80	60
	Should	60	100	100
	Why should	40	60	80
3	Feel	75	100	100
	Why feel	50	100	100
	Want	100	100	100
	Why want	50	75	67
	Action	50	75	100
	Why action	25	75	67
	Should	0	100	100
	Why should	25	50	67

Note. For each social concept, probes were conducted on four social scenarios. Two

questions were asked per social scenario. Each specific question was asked one time

during baseline, social comprehension training, and follow-up probes. No follow-up

data for Child 3 on being left out social concept.

Discussion

The results of this study demonstrated that social comprehension training was effective in increasing each child's social comprehension on the target social concepts. Two out of the three children met the generative social comprehension criterion in which they generalized their responding to questions on a series of novel books within four out of five social concepts. Additionally, the follow-up probes indicated that for all but one child and one social concept (i.e., winning and losing), the other two children generalized their responding to questions on additional novel books and demonstrated response maintenance for four out of five social concepts. Furthermore, all children demonstrated stimulus and response generalization to a novel stimulus mode (i.e., social scenarios) following social comprehension training.

Multiple exemplar training (Stokes & Baer, 1977) was an essential component of the social comprehension training. In the present study, generalization was promoted by using a multiple exemplar approach by implementing stimulus variations of the social concept by the continued presentation of novel books. The procedure provided the child with many opportunities to generalize to new stimulus materials. A probe to assess skill acquisition was implemented prior to each social comprehension training session. If the child failed to meet the mastery criterion for the book, social comprehension training was implemented with the child prior to the next novel book probe. Social comprehension training on a particular social concept continued until the child successfully generalized their responding to questions on three-consecutive novel book probes. Other researchers have also found the multiple

exemplar approach to be an essential training strategy to promote generalized

responding in other complex areas of development, such as question-answering skills

(Jahr, 2001; Krantz, Zalenski, Hall, Fenske, & McClannahan, 1981; Secan, Egel, &

Tilley, 1989); cooperative play (Jahr, Eldevik, & Eikeset, 2000); conversation skills

(Hughes, Killian, & Fisher, 1996), and perspective taking (Charlop-Christy &

Daneshvar, 2003). As with these other studies, stimulus and response generalization

occurred in the current study following training with a minimal number of exemplars.

It is yet to be determined whether or not generative social comprehension

could be achieved across social concepts. If possible, it is also not clear how many

exemplars would be needed to promote generative responding across social concepts.

As Stokes and Baer (1977) have noted, the number of exemplars required can be

expected to vary according to the nature of the task and the child's prior skills.

Furthermore, similar to other language concepts, it is possible that each social concept

may be an independent response class (Baer & Guess, 1971; Garcia, Baer, &

Firestone, 1971; Guess, Sailor, Rutherford, & Baer, 1968; Schumaker & Sherman,

1970). Thus, in order to establish generative social comprehension across social

concepts, separate training may be required for each social concept.

Several variables related to both the instructional procedures and children may

help explain the results. An area of analysis relevant to the interpretation of these

results concerns the nature of the cues that controlled correct responding to the

questions about the social concepts. For any given question, the number and

complexity of the relevant cues that the child must attend to in order to generate a

correct response varied, in addition, some cues were more salient than others. For example, the answers for some questions corresponded with the illustrations in the book (i.e., visual cues), the text read to the child from the book (i.e., auditory cues), and the child's general knowledge and experience about the social concept (i.e., no visual or auditory cues). No controls were established in the present study to control whether or not visual and auditory cues were present as referents for the children to correctly answer the questions. It may be necessary to control the type and complexity of these cues in order to promote the development of generative social comprehension for some children. Additionally, all children in this study showed higher levels of correct responding to more concrete questions, such as "How feel" and lower levels of correct responding to abstract questions, such as "Why feel." In conclusion, additional training that systematically trains a visual-auditory progression of advancing from more concrete to more abstract comprehension questions may be needed to teach children to attend to relevant cues in order to promote the development of generative social comprehension.

The above analysis is supported by the results of three studies regarding responding to wh-questions by children with autism (Jahr, 2001; Krantz, Zalenski, Hall, Fenske, & McClannahan, 1981; Secan, Egel, & Tilley, 1989). For example, Secan, Egel, and Tilley (1989) trained children with autism to answer wh-questions about pictures and assessed generalization of responding to storybook pictures and natural context situations. Generalization was higher for questions in which all relevant cues were visible. In addition, generalization to "what" questions was higher

than that to "how' and "why" questions. These findings suggest that specific training may be needed in order to teach generalized responding to more difficult and complex question forms.

Another instructional strategy to evaluate is selecting the stimulus mode that a child may learn new language concepts most rapidly. For example, in this study, Child 3 did not meet the generative criterion for each social concept; however, he did demonstrate a higher rate of correct responding to questions on the social scenarios. This may be due to a decrease in interfering behaviors due to the fact that real people rather than story characters were involved in the social scenarios. Thus, it is possible that a higher rate of skill acquisition for this child may occur by changing the stimulus mode used for teaching social comprehension. More effective stimulus modes for this child may include observing role-plays and listening to conversations about the social concepts. There are many possible stimulus modes to utilize for teaching social comprehension, such as viewing pictures, reading stories, watching movies, playing computer software, and acting out a plays (Larson, Riedesel, Keene, & Davis, 2003).

While evaluating the direct teaching strategies mentioned above, identifying and treating clinical issues, such as noncompliance, overselectivity, and stereotyped responding may also be needed for some children. These interfering behaviors may be hindering the child's ability to effectively learn new language and social concepts from both structured teaching and learning opportunities in the natural environment.

By addressing clinical issues, the behavior problems that interfere or prevent skill acquisition may be remediated and promote higher levels of skill acquisition.

In regards to characteristics of the participants, especially in relation to the generality of the findings to other children, all of the children were enrolled in an intensive early behavioral intervention program for at least 2 years at the onset of this study. These children's social awareness and ability to learn from the natural environment had improved over the course of their treatment. These children all participated in classroom settings, structured social activities, and peer play activities. It is possible that exposure to social concepts in the natural environment (e.g., reading stories with parents, listening to stories at school, watching videos, and playing with friends) enhanced the children's ability to comprehend the target social concepts rather than social comprehension training alone.

Also, at the onset of this study, all three children had extensive verbal and social skill repertoires. It is unclear how these advanced skill repertoires affected the children's ability to comprehend the social concepts. There may be limitations of the generality of these findings to children with lower levels of language and social skills. It is assumed that children with more limited skill repertoires may lack the requisite skills necessary to acquire generative social comprehension.

It was common for social comprehension training to consume approximately 30 to 45 minutes of each three-hour session and the prompting and fading procedures were highly structured. Ultimately, the goal would be to systematically fade the highly-structured teaching sessions until the children are learning new concepts

without intensive exposure or specialized teaching strategies. To promote this goal, it is well-established that typically-developing children learn language and social skill through observational learning in their everyday experiences.

Future research should investigate the variables that promote observational learning of peer models in naturalistic settings in order to promote the development of social comprehension. This may enhance skill acquisition and generalization because these conditions would be more similar to the natural learning environments in various settings, such as school (Browder, 1986). Furthermore, it is difficult to teach social comprehension every possible social concept or every possible social scenario that a child will be presented with in their daily interactions. Social rules vary amongst different social settings and with different people. Observational learning may be the most efficient way for to acquire social comprehension of new social concepts.

There are a limited number of investigations on teaching more complex language comprehension tasks to children with autism in the behavior-analytic research literature. More systematic analyses on teaching complex language comprehension tasks to children with autism are needed. This may include instructional and generalization strategies, such as multi-modal training, programming response generalization to novel responses, programming stimulus generalization to novel stimulus modes, observational learning, and programming generalization to natural activities involving peers in natural settings. Also, even though this research focused on teaching social comprehension, it is not clear whether

or not a child's ability to comprehend social concepts promotes higher levels of socially-appropriate social interactions. Researchers should also assess whether developing generative social comprehension would lead to improvements in a child's social behavior.

To summarize, the results of this study support the use of children's literature as one avenue to pursue to enhance the development of social comprehension in children with autism. Further investigations on procedures that facilitate complex, generative language, including social comprehension continues to be an important area for future research. Empirical research is needed to identify the conditions under which social comprehension about various social concepts can be efficiently learned in natural social situations.

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Appendix A

Competency-based Staff Training Checklist

The Lovaas Institute

Task-Analyzed Checklist for Competency-Based Staff-Training

INTENSIVE EARLY INTERVENTION BEHAVIOR THERAPIST

Name: _____   Date Began Position: _____

Position: _____   Supervisor: _____

Behavior Therapist – Clinical Competencies	Yes	No	N/A
1. Identify and contract for reinforcers.			
2. Observe and manage new functional reinforcers.			
3. Use a sufficient variety of reinforcement.			
4. Use sufficient distractors and generalized exemplars.			
5. Use behavioral momentum effectively.			
6. Use salient discriminative stimuli.			
7. Follow through after each discriminative stimulus.			
8. Select the most appropriate type of prompt.			
9. Use an appropriate length of a massing sequence.			
10. Provide a well-timed prompt.			
11. Fade a prompt effectively.			
12. Shape a response effectively.			
13. Utilize expansion effectively.			
14. Provide contingent reinforcement.			
15. Provide effective enthusiastic social reinforcement.			
16. Randomize trials unpredictably.			
17. Pace trials quickly.			
18. Provide differential reinforcement.			
19. Work through stereotyped noncompliance.			
20. Identify and avoid inadvertent prompts.			

21.	Use a correction procedure appropriately, repeating the original S^D after correction trials.		

21. Use a correction procedure appropriately, repeating the original S^D after correction trials.

22. Use a punishment procedure appropriately.

23. Follow written treatment instructions appropriately.

24. Maintain 80% to 90% success throughout a treatment activity.

25. End a treatment activity on a success.

26. Use an appropriate length of a treatment activity.

27. Use an appropriate length of a break.

28. Engage the child in appropriate play between treatment interactions.

29. Use operant reinforcement for target spontaneous behavior.

30. Naturalize a treatment activity without a predictable routine.

31. Use incidental teaching effectively.

Behavior Therapist – Case Management Competencies	Yes	No	N/A
1. Accurately log data.			
2. Accurately complete Request for Change of Status Form.			
3. Accurately complete schedule, weekly clinical calendar and corresponding progress note for clinical record.			

Staff: _____ Date: _____

Supervisor: _____ Date:_____

Appendix B

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Sharing

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Appendix C

Data Form

Book: *Try and Stick With It* by Cheri Meiners Probe # _____ Date: Initials: Video Y or N					
Question #	Type of Question	Question	Concrete Question	Abstract Question	Other Appropriate Responses
1	Cover What is the boy doing? Riding his bike Other				
2	Cover Who is helping the boy ride his bike? His mom The lady Other				
3	Cover What is the boy wearing on his head? A bike helmet Other				
The child needs to answer all of the above questions correctly in order to continue the book and specific questions below. If the child does not answer all of the above questions correctly, terminate session and re-try after at least 15 minutes.					
4 **** SR+ Attending	p. 3 What does the boy need to practice? Harder things				

Question #	Type of Question	Question	Concrete Question	Abstract Question	Other Appropriate Responses
Book: *Try and Stick With It* by Cheri Meiners Probe # _____ Date: Initials: Video Y or N					
	Riding his bike Other				
5	p. 3 Why does the boy need to practice harder things? So he can learn how to do it So he can get better at it So he can ride his bike Other				
6	p.7 What should the boy try? New things Harder things Other				
7	p. 7 Why should the boy try new things? Because he might like doing the new things Because it is fun to learn how to do new things				

Book: *Try and Stick With It* by Cheri Meiners
Probe # _____
Date:
Initials:
Video Y or N

Question #	Type of Question	Question	Concrete Question	Abstract Question	Other Appropriate Responses
	Other				
8 **** SR+ Attending	p. 12 How does the boy feel when something is too hard? Frustrated Mad Sad Other				
9	p. 12 Why does the boy feel frustrated when something is too hard? Because the boy wants to do it himself right away Because they boy likes to be good at things he does Because he wants to do it Because he is trying really hard to do it Other				
10	p. 13 What does the boy want to be able to do? The puzzle				

Book: *Try and Stick With It* by Cheri Meiners Probe # _____ Date: Initials: Video Y or N					
Question #	Type of Question	Question	Concrete Question	Abstract Question	Other Appropriate Responses
	Other				
11	p. 13 Why does the boy want to learn how to do the puzzle? Because it is fun to learn how to do new things Because he likes to do puzzles Because the puzzle is new Because it is exciting when it is done Other				
12 **** SR+ Attending	p. 13 What should the boy do if something is too hard? Try and stick with it Try it a little longer Take a break Ask for help Try again later Keep practicing Other				

Book: *Try and Stick With It* by Cheri Meiners					
Probe # _____					
Date:					
Initials:					
Video Y or N					
Question #	Type of Question	Question	Concrete Question	Abstract Question	Other Appropriate Responses
13	p. 13 Why should the boy try and stick with it? Because if he keep trying he will get it Practice makes it easier Because you have to keep trying so you can do it Other				
14	p. 14 Who is trying really hard at baseball? The boy Other				
15	p. 14 Why is the boy trying really hard at baseball? Because the boy wants to be good at baseball Because the boy is learning how to play baseball Because the boy wants to learn how to play				

Book: *Try and Stick With It* by Cheri Meiners Probe # _____ Date: Initials: Video Y or N					
Question #	Type of Question	Question	Concrete Question	Abstract Question	Other Appropriate Responses
	baseball Other				
16 **** SR+ Attending	p. 16 What does the boy want to do about the art project? Quit Give up Stop Other				
17	p. 16 Why does the boy want to quit doing the art project? Because it is too hard Because it is not working good Because he is frustrated with it Other				
18	p. 25 How does the boy's mom feel?				

Book: *Try and Stick With It* by Cheri Meiners Probe # _____ Date: Initials: Video Y or N					
Question #	Type of Question	Question	Concrete Question	Abstract Question	Other Appropriate Responses
	Happy Excited Other				
19	p. 25 Why does the boy's mom feel happy? Because the boy is learning how to ride his bike Because the boy is riding his bike all by himself Other				

Appendix D

Examples of Social Scenarios

Child:

Objective: Social Scenario Probes

Social Scenario	Date/Initials/ Data
Probe Sharing 1 Social Scenario: Toys (all the markers, all the paint, all the blocks, puzzle etc…) One Person has all of the toy. Child has none of the toy. Child asks for some of the toy. If needed you can prompt the Child to ask person. Once Child asks for some of the toys, give him some of the toys. Before or as he starts playing with the toys ask the following social comprehension questions: How do you feel? Why do you feel (emotion)?	Date: Initials: Circle adult, peer, or sibling Specific Questions: How do you feel? Why do you feel happy? Data: /2

Probe Sharing 2 Social Scenario: Basketball Person plays basketball and keeps shooting hoops. Child waits his turn to shoot a basket. Child asks for a turn. If needed, you can prompt Child to ask person for a turn. Once Child asks, tell him "no, not yet. I'm still playing." Then ask the following social comprehension questions: What did I say? Why did I say that?	Date: Initials: Circle adult, peer, or sibling Specific Questions: What did I say? Why did I say that? Data: /2
Probe Sharing 3 Social Scenario: Riding something (bike, scooter, sled, blanket ride, etc…) Child is riding something. Other Person is waiting off to the side for a turn, watching Child ride something. Stop Child, point to person, and ask the following social comprehension question: What does (person) want? Why does (person) want to a turn?	Date: Initials: Circle adult, peer, or sibling Specific Questions: What does (person) want? Why does (person) want to ride the scooter? Data: /2

Probe Sharing 4 Social Scenario: Game boy, computer, or other electronic game Person plays game. Child waits and watches person. Child asks for a turn. Person says, "no, I'm playing it." Then ask Child the following social comprehension questions: What should (person) do? Why should (person) share?	Date: Initials: Circle adult, peer, or sibling Specific Questions: What should (person) do? Why should (person) share? Data: /2