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The Use of Metacognitive Verbs by a Student with ASD: Marking Perspective in Conversational Discourse During Narrative Intervention

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THE USE OF METACOGNITIVE VERBS BY A STUDENT WITH ASD: MARKING PERSPECTIVE IN CONVERSATIONAL DISCOURSE DURING NARRATIVE INTERVENTION

by

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ABSTRACT

The use of metacognitive verbs by a student with ASD: Marking perspective in conversational discourse during narrative intervention

by

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Utah State University, 2017

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The purpose of this study was to assess whether a program designed to teach narrative language skills was effective for improving the use of metacognitive verbs produced during conversations that took place during intervention to mark perspective.

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Mary Ann Hammon Stenquist

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INTRODUCTION

Autism Spectrum Disorder (ASD) has been a large area of study for many fields. Some of the core features of ASD include a failure to plan using information from multiple sources, a hyper-focus on details at the expense of gist-level propositions, and limited use of mental state and to encode goals and motivations of characters (Capps, Losh, & Thurber, 2000). Nowhere is this more evident than in the comprehension and production of narrative discourse. Narratives require the ability to combine hierarchically organized structures, or landscape of action, with the motivations, thoughts and feelings of the main characters in the story, also known as the landscape of consciousness (Bruner, 1986). Theory of Mind, or the ability to identify the motivations and causes of another individual's emotional or mental states, proposes that another core feature of ASD is an inability to infer the emotional or mental states of others. This deficit further impairs one's ability to engage in ongoing social interactions and develop the linguistic knowledge (e.g., metacognitive and causal language) necessary for understanding the relationship between events in discourse (Eigsti, Marchena, Schuh, & Kelley, 2011). Many children with ASD demonstrate failure to plan and an inability to infer the emotional or mental states of others. It has been proposed that this is a core feature of ASD. This deficit may impair their narrative production abilities as they tend to be below the developmentally appropriate level expected for children their age.

Many studies have examined the narratives of children with ASD, and the effect that these core deficits have on narrative production when compared to other populations. Loveland, McEvoy, Tunali and Kelley (1990), studied the narrative production skills of children with ASD as compared to children with Down Syndrome (DS). Participants were shown a puppet show or video skit, then asked to tell a story about what they saw and answer comprehension questions. Participants ranged from 5-27 years of age, and included 16 individuals with high functioning autism and 16 individuals with DS. The mean age of participants with ASD was 13.5 years, while the mean age of participants with DS was 13.3 years. Participants were matched on verbal mental age. The narratives of children with ASD tended to lack central themes, and included more grammatical errors than the narratives of individuals with DS. Their narratives also included information that was irrevelant to the story (Capps et al., 2000).

Baren-Cohen, Leslie, and Frith (1985) studied Theory of Mind (ToM) in a picture sequencing task by measuring the production of metacognitive verbs. Preschool children with high functioning autism were compared to children described as ‘low-ability Down syndrome’ and Typically Developing (TD). Participants were selected based on their participation in a previous study, which evaluated the ability of children with ASD, DS, and children who were TD to attribute intentional states to others. There were 21 children with ASD (14 boys, 7 girls), 15 children with DS (sex ratio approximately 1:1), and 27 children who were developing typically (TD) (sex ratio approximately 1:1).

Participants were instructed to arrange four pictures in correct sequence, and then to narrate a story based on the picture sequence they made. The picture sequences were analyzed for story comprehension and narrative skills. Five types of stories were used for the picture sequencing task, including Mechanical 1: Objects interacting causally with each other), Mechanical 2: People and objects acting causally on each other, Behavioural 1: A single person acting in everyday routines not requiring attribution, Behavioural 2: People acting in social routines, involving more than one person, but not requiring attribution of mental states, and Intentional: People acting in everyday activities requiring attribution of mental states.

Results from this study revealed that children with autism performed better than their typically developing peers in the Mechanical condition (objects interacting causally with each other; people and objects acting causally on each other), but performed worse than their typically developing peers on the Intentional condition (people acting in everyday activities requiring attribution of mental states). Performance scores on the Intentional condition were also much lower than the scores achieved by children with Down syndrome. When compared with children with DS, children with ASD did not use metacognitive terms (e.g., thinking, knowing) in their narratives. These results support other research findings that, in their conversations with caregivers, children with ASD refer to mental states less frequently than children with DS (Tager-Flusberg, 1992).

Kelley, Paul, Fein and Naigles (2006) studied language deficits in children with ASD as compared to children who were developing typically (TD). Participants for this study were selected based on early diagnosis of ASD and treatment in intensive behavioral programs. According to the study, the group with ASD had 'IQ levels in the normal range, were in age-appropriate mainstream classes, and had improved to such an extent that they were considered to be functioning at the level of their typically developing peers.' Children were selected and matched based on age and sex, with ages ranging from five to nine. A battery of ten language assessments was given to participants, including The Test for Auditory Comprehension of Language, Third Edition (TACL-3) (Carrow-Woolfolk, 1985), The Expressive One-Word Picture Vocabulary Test (EOWPVT) (Gardner, 1990), The Stanford-Binet Memory for Sentences Subtest (Thorndike, Hagel, & Satler, 1986), The Wug Test of Productive Morphology (Berko, 1958), Understanding of Complex Syntax (deVilliers & Roeper, 1995), Verb Argument Structure (Naigles, Gleitman, & Gleitman, 1993), Categorical Induction (Gelman & Markman, 1986), Certainty differences with metacognitive verbs (Moore, Bryant, & Furrow, 1989), Theory of Mind tasks (Wimmer & Perner, 1983; Perner, Leekham, & Wimmer, 1987) including the Unexpected Location task and Unexpected Contents task, and the Narrative Capability task.

Although many assessments were administered in this study, only the methodology and results from the Theory of Mind tasks and the Narrative Capability task will be discussed here. The first Theory of Mind task, the Unexpected Location task, was based on the Maxi task (Wimmer & Perner, 1983), with slight variations. In this task, children watched a puppet show where Astro was going on a trip and needed to bring her toy monkey with her. The children were asked to help by putting Astro's toy monkey in her blue suitcase. Astro informed the children that she had forgotten snacks, so she left to the store to get some for her trip. The experimenter asked the children if they would like to play a trick on Astro by moving her toy monkey from the blue box (suitcase) to the white box. The children were asked one target questions and two control questions. The target question was: "Where would Astro look for the monkey when she came back from the store?" The control questions were: "Where is the monkey now?", and, "Did Astro see that the monkey was being moved?" In the original Unexpected Location task (Wimmer & Perner, 1983), the children did not engage in the deception of Astro, but merely watched it happen. The task alteration of having children deceive Astro allowed them to be actively involved in the deception rather than passive observers.

For the second Theory of Mind task, the Unexpected Contents task (Perner et al., 1987), participants were shown a standard "band-aid" box and asked what was inside. The box was then opened, revealing balloons inside the box. A control question was asked: "What was really in the box?", as well as two target questions: "What do you think was inside the box before it was opened?", and, "If the box had been shown to your best friend, what would your friend have thought was inside the box?" (Kelley et al., 2006). This Unexpected Contents task was altered from the original task by Perner et al. (1987).

The Narrative Capability task (Capps et al., 2000; Tager-Flusberg & Sullivan, 1995 in Kelley et al., 2006) required participants to narrate the wordless picture book of "Frog, Where are You?" (Mayer, 1969). First, both the child and the experimenter looked through the book together silently, with the experimenter turning the pages. Then, children were asked to retell the story in their own words while looking at the book.

The results of this study concluded that although children with ASD produced narratives that were similar in length and grammaticality to those of their peers, they included inaccurate or redundant information, and few mentions of the characters' goals and motivations. Results of the Theory of Mind tasks revealed that children with ASD tended to interpret questions only in terms of their own knowledge states, and did not take into account the knowledge states of others (Kelley et al., 2006).

The literature that has been reviewed strongly suggests that many students with ASD demonstrate difficulty learning and using the words needed to mark perspective in themselves and others. There have been few studies that have examined whether interventions are effective in helping students with ASD learn to use the metacognitive verbs needed to mark perspective.

Dodd, Ocampo, and Kennedy (2011) studied the effect of a narrative-based language intervention program on the perspective-taking skills and use of metacognitive verbs of 18 highly verbal students with ASD (ages 9;7-12;2). Two intervention approaches were compared: Perspective-Taking Intervention (PTI), and Narrative-Based Language Intervention (NBLI). Both groups received an organizational framework to teach story elements. Students in the PTI group were required to identify character traits, make inferences about characters, and identify the emotions and their causes before they retold the story from a character's perspective. Students in the NBLI group were given direct instruction in organization and sequencing, use of transitional wording, and vocabulary. Findings revealed that PTI was more effective than NBLI on students' ability to retell a story from different characters' perspectives. The PTI treatment group also demonstrated a greater difference pre- and post-intervention in the total number of different metacognitive verbs used. Some of the limitations of this study included the pre- and post-intervention data collection procedures, which were collected in a single session. This procedure of collecting data did not allow for the variability of data and results that can occur due to the difficulty with attention and regulatory control among students with ASD (Dodd et al., 2011).

In a more recent study, Petersen et al. (2014) examined the effects of an individualized, systematic language intervention on the personal narratives of 3 school-age children (ages 6-8 years) with ASD in a single-subject, multiple-baseline design across participants and behaviors study. The Test of Narrative Retell (TNR; Petersen & Spencer, 2010) was used to elicit narrative retells for baseline data collection. Based on the children's' retells at baseline, two to three story grammar elements and two to four linguistic forms that were missing or emerging from the retells were selected as intervention targets. Across 12 sessions, children were taught the story grammar elements, given models of storytelling, and taught to tell their own stories with and without the picture icons representing the story elements.

Results revealed improvement in the targeted language features selected for each participant of story grammar targets (i.e., action, problem, consequence, emotion, ending emotion, plan) and linguistic complexity targets (i.e., temporal conjunctions, causality, adverbs). Scruggs and Mastropieri (1998) propose that PND scores above 90 represent very effective interventions, scores from 50-70 are questionable, and scores below 50 are ineffective. All seven variables evaluated in the Petersen et al. (2014) study showed PND values ranging from 45% to 100%, indicating effective intervention. Two students' story grammar intervention targets involved *plan,* which includes metacognitive verbs (e.g., thought, decided) while the other student targeted action and problem as their story grammar intervention target. The elements of plan and combined emotions showed the most reliable treatment effects, indicating the effectiveness of teaching emotions with story grammar elements. A limitation of this study included not targeting narratives as a whole during intervention. Two to three story grammar elements and two to four linguistic complexity elements were selected from participants' baseline performances as intervention targets. Data were collected for each of the participants' individual targets, but not on their performance using all of the story elements in their narrative productions.

To address the limitations of the Dodd et al. (2011) and Petersen et al. (2014) studies, Gillam, S., Hartzheim, Studenka, Simonsmeier, & Gillam, R. (2015) researched the effectiveness of a narrative intervention program targeting the use of metacognitive and causal language, and whether it resulted in positive gains in narrative production for children with ASD. Five children (2 girls and 3 boys) participated in this study, ranging in ages from 8 to 12 years old. Participants received two 50-minute individual sessions per week for a total of 21-33 sessions. The number of sessions varied by participant. Spontaneous stories were collected weekly from each participant and analyzed for story complexity, story structure, and the use of metacognitive and causal language

All of the children that participated in the narrative intervention program made clinically significant gains on all three measures of narration: The Monitoring Indicators of Scholarly

Language (MISL), Story Knowledge Index (SKI), and Perspective Taking Index (PTI), and maintained these gains after intervention was discontinued. Intervention resulted in positive outcomes for both narrative comprehension and production for children with ASD. Improvements in metacognitive and causal language were observed that resulted in overall story complexity.

The components of intervention believed to have resulted in the improvement observed in students' narratives included a focus on increasing students' knowledge and use of narrative text structure (e.g., story grammar elements) and the causal and temporal relationships between them; increasing knowledge and use of specific linguistic structures necessary for understanding and describing the mental states of characters; and the provision of multiple opportunities for students to practice using new language structures through retelling, summarizing and composing stories.

The studies reviewed thus far show that students with ASD have been shown to have difficulty using metacognitive verbs to refer to the mental states of others. The studies of Dodd et al. (2011), Petersen et al. (2014), and Gillam et al. (2015) showed that students with ASD responded well to a narrative intervention program and improved their use of metacognitive and linguistic verbs in spontaneous narratives after treatment. Very few intervention studies have been conducted to determine how best to improve the use of metacognitive verbs in narrative or conversational discourse. In Dodd et al. (2011), participants listened to a selected story two times before they were asked to retell the story from the perspective of two different characters in the book. In Petersen et al. (2014), participants were prompted to tell their own personal story after the clinician modeled a personal story for them. Although narrative productions were analyzed for use of metacognitive and linguistic verbs in Dodd et al. (2011) and Petersen et al. (2014), neither study examined the use of metacognitive verbs in conversational discourse.

In Gillam et al. (2015), the data that was reported that related to the use of metacognitive verb use was collected in stories elicited after each session. The spontaneous story probes were elicited using single scene pictures. The student was asked to create a story about the picture. The story was then analyzed for story structure and language features including the use of metacognitive verbs to refer to the mental states of the main characters in the spontaneously generated stories.

The purpose of the current study was to explore the use of metacognitive verb use during conversational discourse that occurred within the narrative intervention sessions of one student with ASD who participated in Gillam et al. (2015). We were interested in determining whether the student used metacognitive verbs during conversational discourse and what impact modeling had on the use of the terms.

METHODOLOGY

The data for this project came from a multiple baseline across participants study that was conducted with 5 children with ASD (ages 8-12). In the parent study, intervention was provided for two 50-minute individual sessions per week for a total of 21-33 sessions, depending on the students' level of performance. Students were asked to create stories from single scene prompts each week. These stories were analyzed for narrative proficiency and for the use of metacognitive verbs. The data for the larger study is reported in Gillam et al. (2015). Students in Gillam et al. (2015) demonstrated significant gains in narrative proficiency and their use of metacognitive verbs.

NARRATIVE INTERVENTION

The description of the narrative intervention was reported in Gillam et al. (2015) and is summarized briefly here. During intervention, the participants were provided the Supporting Knowledge in Language and Literacy (SKILL) intervention program. This program uses icons and graphic organization to assist students in learning to tell coherent, logical, elaborated stories. This narrative intervention program is divided into three different phases during which students learn about story elements, how the elements are connected, and how to use specific linguistic structures to produce narratives that range from simple to complex. Students are also taught how to evaluate and appraise their own narratives and those of others, including frequently read children's trade books such as Miss Nelson is Missing (Allard, 1977). Completion of Phase I occurs when the student was able to identify the icons, give definitions or examples of each icon, create a story using a storyboard containing all of the elements, and answer comprehension questions about story elements. In Phase II, students learn about elements of elaboration, such as linguistic structures, metacognitive and causal language to create complex stories. Emphasis in Phase II is placed on making connections between story grammar elements using metacognitive verbs (i.e., know, decide, want) and causal language (because, as a result, consequently). In order to transition to Phase III, students were required to be able to create a story using a complex storyboard with minimal assistance that included all of the story elements, the words *because* or *so,* 2 or more feeling words, 2 or more metacognitive or linguistic verbs, 1 or more adverb, and 1 or more elaborated noun phrase. Additionally, they had to be able to answer comprehension questions related to a story told to them, and to recall details of the story related to story elements. Phase III prompts the establishment of independence in story telling by implementing metacognitive strategies to tell and edit generated stories. The benefits of this intervention program include its ability to move at the rate of the individual, allowing an adaptation to each child's unique speed of learning and explicit lessons on story elements. Students are given multiple opportunities to create and evaluate their own stories, stories told by others, and in children's literature (Gillam et al., 2015).

The current project was designed to examine one student's use of metacognitive verbs during conversational discourse that took place during the intervention sessions. Each of 31 sessions that the 10 year old-male student with ASD participated in for a total of about 50 minutes each session, was transcribed verbatim and included the clinician and student utterances. Approximately 26 hours of intervention sessions were transcribed. Each session took approximately two hours for experienced research assistants to transcribe, for a total of 62 hours of transcription time. There were 15 sessions conducted during Phase I; 8 sessions during Phase II, and 8 sessions during Phase III. Each metacognitive verb the student and clinician used was coded as having been modeled by the clinician during the session, or novel, having not been mentioned by the clinician during the session. Specifically, metacognitive verbs were coded as [MV] if they were modeled by the clinician during the intervention session; as [M] if the verb was produced by the child after being modeled by the clinician during the intervention session and [N] if the verb was produced by the child and had not been modeled by the clinician during the intervention session (but may have been modeled in an earlier session).

CODING GUIDELINES

Metacognitive verbs were marked and coded in their root form. Past or present variations of a root metacognitive verb were not counted as a new metacognitive verb. For example, if the clinician used *think* as a metacognitive verb and the child produced *thought* later in the session, *thought* (produced by the student) would be coded as a matched metacognitive verb [M] (metacognitive verb modeled by the clinician and then produced by the student) because it is a past tense variation on the root word *think* previously modeled by the examiner. This coding rule was put into place to analyze the type of metacognitive verbs used in addition to the number of metacognitive verbs produced.

Example (E = Examiner; C = Child):

E You think [MV] you can tell a good story?

C I thought [M] I already told a story.

GENERAL TRANSCRIPTION PROCEDURES

Each intervention session was videotaped and digitally recorded, then uploaded to a secure server. Discourse of both the examiner and child produced during the sessions was transcribed into C-units (Loban, 1976) using Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 2004) conventions. A C-unit consisted of an independent main clause and any subordinate clauses or phrases attached to it (Loban, 1976). The research assistants and transcribers were blind to the purpose of the study.

Types of utterances including mazes and abandoned utterances were excluded when coding for metacognitive verbs. Mazes were denoted by ( ) and included fillers (i.e., “um,” “uh,” “hmm,” and “mmm”) (e.g., “And (uh) she went (uh) home”), repeated/reformulated words (e.g., “(My) my head hurts”), and revisions (“(She) they became friends”). Abandoned utterances were denoted by > and included incomplete thoughts (e.g., “Bruce was> The dolphin swam away”).

Comments were denoted by (( )) and included statements or questions not considered to be part of the story (e.g., "Lisa and ((I forgot his name)) went home").

According to SALT criteria (Miller & Chapman, 2004), these utterances (mazes and abandoned utterances) are not analyzed by the data system. Therefore, any metacognitive verbs that appear in a maze or an abandoned utterance are not counted in the SALT database. To follow SALT's criteria, metacognitive verbs that appeared in a maze or an abandoned utterance were not coded as modeled [MV], matched [M], or novel [N].

Narrator comments, or comments that were outside the story, were denoted by ( ). According to SALT criteria, narrator comments are not considered by the SALT analyses and are therefore not counted in the metacognitive verb total.

Example (E = Examiner; C = Child):

C She wanted to travel.

C (I forgot the boy's name).

However, the narrator comments in our study were coded for metacognitive verbs and included in the overall count as they were part of the conversational discourse that occurred during the intervention sessions and therefore relevant to the purpose of this study. To include these metacognitive verbs that appeared in the narrator comments, metacognitive verbs were counted by hand and then added to the number of metacognitive verb total that SALT generated through analysis.

Comments lines between utterances were denoted by = and included when a third party spoke to either the examiner or the child (e.g., '= third party speaks to examiner'). As mentioned previously, utterances of only the examiner and child were analyzed; therefore, utterances made by a third party were transcribed, but not analyzed or coded for metacognitive verbs.

Transcribers were selected after completing SALT training and achieving 80% reliability or higher to the 'gold standard' (a SALT transcriber, trained in SALT who consistently achieved greater than 80% reliability to SALT conventions). The research assistants reviewed one another's transcriptions, and any inaccuracies or discrepancies were resolved through consensus. Twenty percent (about 7) of the transcripts were randomly selected to calculate transcriber reliability for using the SALT transcriptions and C-unit segmentation. The primary and secondary transcribers were 91.2% reliable with one another for using the SALT transcription conventions, and 90% reliable in C-unit segmentation.

Two student research assistants participated in coding the transcribed sessions. Coders were selected by their ability to identify metacognitive verbs and code them correctly with a minimum of 80% accuracy. The first author and one research assistant coded each transcript for the use of modeled (verbs modeled by clinician), matched (verbs modeled by clinician and used by student), and novel metacognitive verbs (metacognitive verbs generated by student). Reliability was determined by identifying whether raters assigned the same code (i.e. MV, M, N) to each metacognitive verb. Coding reliability was calculated by dividing the total number of correctly identified metacognitive verbs (i.e., MV, M, N) that were agreed upon by the total number of metacognitive verbs in the transcript, and multiplying by 100. Six randomly selected transcripts were used to calculate reliability. The two coders were found to be 95.4% reliable for coding metacognitive verbs using the MV, M and N codes. Each of the 31 sessions took approximately 30 minutes to code for metacognitive verbs, yielding a total of 16 hours of coding time that was separate from the total transcription time.

RESULTS

Baseline sessions. During each baseline session, the student was asked to generate a story using a single picture scene that changed each session. He was also asked to retell a story during each baseline session. Table 1.1 shows the type of metacognitive verbs: modeled verbs (metacognitive verbs modeled by the clinician), metacognitive verbs modeled and used (metacognitive verbs modeled by clinician and used by student) and novel metacognitive verbs (metacognitive verbs generated by student) used during baseline and intervention sessions. In the retells told during baseline sessions, he was observed to produce 3 verbs modeled by the clinician (know, remember, thought) and one novel verb (want). B1 represents the first baseline session, while T1 represents the first intervention session and so on. He produced one novel metacognitive verb when asked to create his own story in response to a single scene prompt during his baseline session #2 (remember). He produced one novel metacognitive verb when asked to retell a story, also in baseline session #2. During baseline session #3, he produced 2 modeled metacognitive verbs in the story retell condition. He produced one modeled metacognitive verb during baseline session #4, also in the story retelling condition. In total, he produced 4 different metacognitive verbs during the 4 baseline sessions, 3 of which occurred in the retell condition. It appeared to be more likely that the student used a metacognitive verb after hearing it, than in the story generation condition, during which time no model was provided.

Treatment sessions. Note that in Table 1.1, each metacognitive verb has a superscript next to it. For example, in the column titled MVs Modeled, during T1, the clinician modeled the words *forget, remember, guess, decide, think, want* and *know*. This was the first time the words forget, guess, and want, were modeled during a session. The word *decided* had been modeled during each of the 4 baseline sessions in the story retell condition, so this was the fifth session during which this word was encountered. The word know/knew had been modeled during 2 of the baseline sessions, and earned a superscript of 3 during T1, having now been modeled during 3 sessions. The superscripts do not indicate the number of times that the words were modeled during the session, only that the word was encountered during the session.

The column titled, MVs Modeled and Used in Table 1.1, indicates the sessions during which the student used a metacognitive verb that had been modeled by the clinician during the session at hand. In this case, the superscript represents that the student heard the word and used it during the session. This does not indicate the number of times the student used the word during the session, only that it was encountered (modeled) and used by the student.

Table 1.1 Modeled verbs, modeled verbs used, and novel metacognitive verbs used during baseline and intervention sessions

Session Number	**Topic/ Theme**	**MVs Modeled**	**MVs Modeled & Used**	**Novel MVs**	**Total MVs Used (modeled or novel)**	**MISL Scores**
Single Scene						
B 1	Beach Scene Picture Description	0	0	0	0	4
B 2	Beach Scene Picture Description	0	0	remember	1	4
B 3	Skiing Picture Description	0	0	0	0	3
B 4	Skiing Picture Description	0	0	0	0	1
Retell						
B 1	Dolphin Story	decided, knew	0	0	0	2
B 2	A Day in the Snow	decided, thought, realized	0	want	1	8
B 3	The School Play	decided, know, remember	know, remember	0	2	3
B 4	Steve the Builder	thought, decided	thought	0	1	11
Avg. Use at Baseline		3	1	1	1	6
Intervention Phase 1						
T 1	Story Element Introduction, Character, Setting	forget[1], remember[1], guess[1], decide[1], think[1], want[1], know[1]	forget[1], guess[1], think[1], want[1] 4/7	0	4	5
T 2	Take-Off, Feelings	remember[2], want[2],	want[2], know[1],	forget[1]	5	13

		know^{2}, think^{2}, pretend^{1}, plan^{1}, understand^{1}, expect^{1}	think^{2}, expect^{1} 4/8			
T 3	Feelings, Plan, Action	remember^{3}, think^{3}, want^{3}, plan^{2}, decide^{2}	think^{3}, plan^{1}, decide^{1} 3/5	know^{1}, forget^{2}, guess^{1}	6	13
T 4	Wrap-up	want^{4}, think^{4}, decide^{3}, plan^{3}	want^{3}, think^{4}, decide^{2} 3/4	remember^{1}, know^{2}, forget^{3}, pretend^{1}	7	5
T 5	Story Element Identification	want^{5}, remember^{4}, decide^{4}, plan^{4}, forget^{2}, remind^{1}	want^{4}, decide^{3} 2/6	know^{3}, think^{1}	4	7
T 6	Parallel Story Retelling with Icons	pretend^{2}, know^{3}, forget^{3}, remember^{5}, decide^{5}, worry^{1}, concentrate^{1}, wonder^{1}, guess^{2}, promise^{1}	know^{2}, forget^{2}, remember^{1}, decide^{4} 4/10	think^{2}, want^{1}, plan^{1}	7	3
T 7	More Practice with Parallel Story Development with Storyboard	remember^{6}, know^{4}, want^{6}, decide^{6}, think^{5}, realize^{1}, plan^{5}	remember^{2}, want^{5}, decide^{5}, think^{5}, know^{3}, realize^{1}, plan^{2} 7/7	forget^{4}	8	5
T 8	More Practice with Parallel Story Development	want^{7}, know^{5}, realize^{2}, expect^{2}, understand^{2}	want^{6}, know^{4}, realize^{2} 3/5	think^{3}, remember^{2}, decide^{1}, forget^{5}	7	10
T 9	Parallel Story Development with Storyboard	remember^{7}, know^{6}, want^{8}, think^{6}, forget^{4}, remind^{2}, realize^{3}, brainstorm^{1}, expect^{3}	know^{5}, want^{7}, think^{6}, forget^{3}, realize^{3}, brainstorm^{1} 6/9	decide^{2}	7	3
T 10	Comprehension Literature Unit	remember^{8}, know^{7}, want^{9}, wonder^{2},	wonder^{1}, guess^{2}, know^{6}, decide^{6},	think^{4}	6	15

	Mushroom in the Rain; Before/After *Musrhoom in the Rain*	guess^{3}, decide^{7}, expect^{4}	expect^{2} 5/7			
T 11	Exit Testing	want^{10}, know^{8}, think^{7}, remember^{9}, expect^{5}, decide^{8}, promise^{2}, brainstorm^{2}, remind^{3}, realize^{4}	want^{8}, know^{7}, think^{7}, expect^{3}, decide^{7}, realize^{4} 6/10	forget^{6}	7	10
T 12	Additional Practice	want^{11}, forget^{5}, remember^{10}, know^{9}, guess^{4}, plan^{6}	want^{9}, forget^{4}, remember^{3}, know^{8} 4/6	think^{5}, remind^{1}, decide^{3}, realize^{1}	8	13
T 13	Additional Practice	think^{8}, plan^{7}, recognize^{1}, know^{10}	0/4	guess^{2}, want^{2}, decide^{4}, remember^{3}, forget^{7}	5	18
T 14	Additional Practice	want^{12}, think^{9}, dream^{1}, decide^{9}, guess^{5}, remember^{11}, brainstorm^{3}	want^{10}, think^{8}, dream^{1}, decide^{8} 4/7	know^{6}, forget^{8}	6	11
T 15	Additional Practice	remember^{12}, know^{11}, think^{10}, understand^{3}, confuse^{1}	remember^{4}, know^{9}, think^{9}, confuse^{1} 4/5	forget^{9}, dream^{1}, want^{3}, decide^{5}, guess^{3}, expect^{1}	9	13
Phase 2						
T 16	Introduction to Elaboration, Comparison of Simple and Elaborated Stories, Elaboration on Character	understand^{4}, want^{13}, know^{12}, decide^{10}, remember^{13}, expect^{6}	want^{11}, know^{10}, decide^{9}, remember^{5}, expect^{4} 5/6	think^{6}	6	11

T 17	Dialogue Mini-Lesson; Elaborating on the Plan, Action, Complication, Sequences (PACS); Practicing Complexity Using PACS through Parallel Story Development	remember^{14}, know^{13}, worry^{2}, think^{11}, hope^{1}, decide^{11}, plan^{8}, expect^{7}, realize^{5}	remember^{6}, know^{11}, think^{10}, decide^{10}, expect^{5} 5/9	want^{4}, forget^{10}, guess^{4}	9	17
T 18	Parallel Story Retelling with Icons	remember^{15}, want^{14}, remind^{4}, brainstorm^{4}, understand^{5}, plan^{9}, forget^{6}	remember^{7}, want^{12}, plan^{3}, forget^{5} 4/7	hope^{1}, think^{7}, know^{7}, decide^{6}	8	22
T 19	Parellel Story Retelling without Icons, Elaboration on Action (Adverbs)	want^{15}, remember^{16}, know^{14}, forget^{7}, think^{12}, understand^{6}	want^{13}, remember^{8}, know^{12}, forget^{6}, think^{11} 5/6	realize^{2}, worry^{1}, decide^{7}	8	24
T 20	Elaboration on Setting, and Feelings	want^{16}, know^{15}, remember^{17}, think^{13}, forget^{8}, imagine^{1}, understand^{7}, decide^{12}	want^{14}, know^{13}, think^{12}, forget^{7}, decide^{11} 5/8	expect^{2}	6	14
T 21	Comprehension Literature Unit *Tacky the Penguin*	want^{17}, remember^{18}, think^{14}, expect^{8}, hope^{2}, confuse^{2}, decide^{13}	want^{15}, think^{13}, expect^{6}, confuse^{2} 4/7	know^{8}, forget^{11}, wonder^{1}, believe^{1}	8	20
T 22	Elaborated Noun Phrases	want^{18}, know^{16}, think^{15}, decide^{14}, remember^{19}, expect^{9}, forget^{9}	want^{16}, know^{14}, think^{14}, decide^{12}, remember^{9}, expect^{7}	believe^{2}	7	18

			6/7			
T 23	Exit Testing	know^{17}, remember^{20}, forget^{10}, remind^{5}, promise^{3}, plan^{10}	know^{15}, plan^{4} 2/6	want^{5}, think^{8}, decide^{8}	5	32
Phase 3						
T 24	Literature Comprehension Unit (*Miss Nelson is Missing)*	remember^{21}, want^{19}, think^{16}, worry^{3}, decide^{15}, wonder^{3}, promise^{4}, remind^{6}	want^{17}, think^{15}, decide^{13}, wonder^{2}, 4/8	know^{9}, forget^{12}	7	8
T 25	If/Then with *Miss Nelson is Missing;* Using the Self-Scoring Storyboard and/or the Self-Scoring Rubric	want^{20}, decide^{16}, remember^{22}, wonder^{4}, think^{17}, forget^{11}, know^{18}, plan^{11}	decide^{14}, remember^{10}, wonder^{3}, know^{16}, plan^{5} 5/8	0	5	24
T 26	Co-Creating Sequenced Stories	want^{21}, remember^{23}, think^{18}, know^{19}, forget^{12}, decide^{17}, plan^{12}, understand^{8}, worry^{4}	want^{18}, remember^{11}, know^{17}, think^{16}, decide^{15}, worry^{1} 6/9	promise^{1}	6	25
T 27	Beach Scene Picture Description Story Intervention	think^{19}, understand^{9}	think^{17} 1/2	want^{6}, decide^{9}, know^{11}	4	17
T 28	Using the Self-Scoring Storyboard/Rubric to Edit Co-created Sequenced Stories; Co-creating Stories from Single Scenes	remember^{24}, want^{22}, think^{20}	remember^{12}, think^{18}, want^{19} 3/3	know^{12}, decide^{10}, plan^{3}, forget^{13}	7	15

T 29	Using Self-Scoring Storyboard/Rubric to Edit Co-Created Stories	want[23], know[20], remember[25], decide[18], think[21], concentrate[2]	decide[16], think[19] 2/6	forget[14]	3	29
T 30	Beach Picture Description Story Intervention	forget[13], remember[26], think[22], know[21]	remember[13], think[20] 2/4	decide[11], guess[5], want[8]	5	26
T 31	Creating Independent Stories from Single Scenes and Verbal or Written Prompts; Using the Self-Scoring Storyboard and/or the Self-Scoring Rubric to Edit Stories	remember[27], think[23], know[22], want[24], decide[19], concentrate[3] understand[10]	think[21], know[18], want[20], decide[17] 4/7	forget[15], plan[4]	6	28

The column titled, Novel MVs in Table 1.1 lists words that the student used that were not modeled in the immediate session, and the sessions in which the word occurred. So, for example, notice that the first time the student uses the word *forget* during a session when it was not modeled, was during T2. The word was not modeled during T3, but was used. This is the second time the student used the word *forget* without a model during the session.

This is important notation because it allowed us to look at the number of sessions during which the student heard the word and then used it, and the number of sessions during which the student did not hear the word and used it. It also allowed us to examine the relationship between the number of sessions during which the word was modeled and the number of sessions the student used the word.

For example, the word *decide* had been used in 4 baseline sessions and 2 treatment sessions before the student used it for the first time (Table 1.1). When the student used it, it was during a session when it was modeled (T3). The student heard the word spoken during 6 sessions before he used the word.

Scatterplots. It can be noted that the word *remember* in T25 (Table 1.1) had now been modeled during 22 treatment sessions and one baseline session. In order to better understand the relationship between the models provided by the clinician and the metacognitive verbs produced by the student, scatterplots were created. Figure 1 is a scatterplot that represents the relationship between the metacognitive verbs modeled by the clinician and those produced by the student during any one session. This Figure 1, indicates that the two variables were linearly related such that the models provided by the clinician were significantly related to the number of metacognitive verbs produced by the student. The R^2 value of 0.307 indicates a large correlation between the two variables, such that 30% of the variance in the student's use of metacognitive verbs within any one session may be accounted for by the models provided by the clinician.

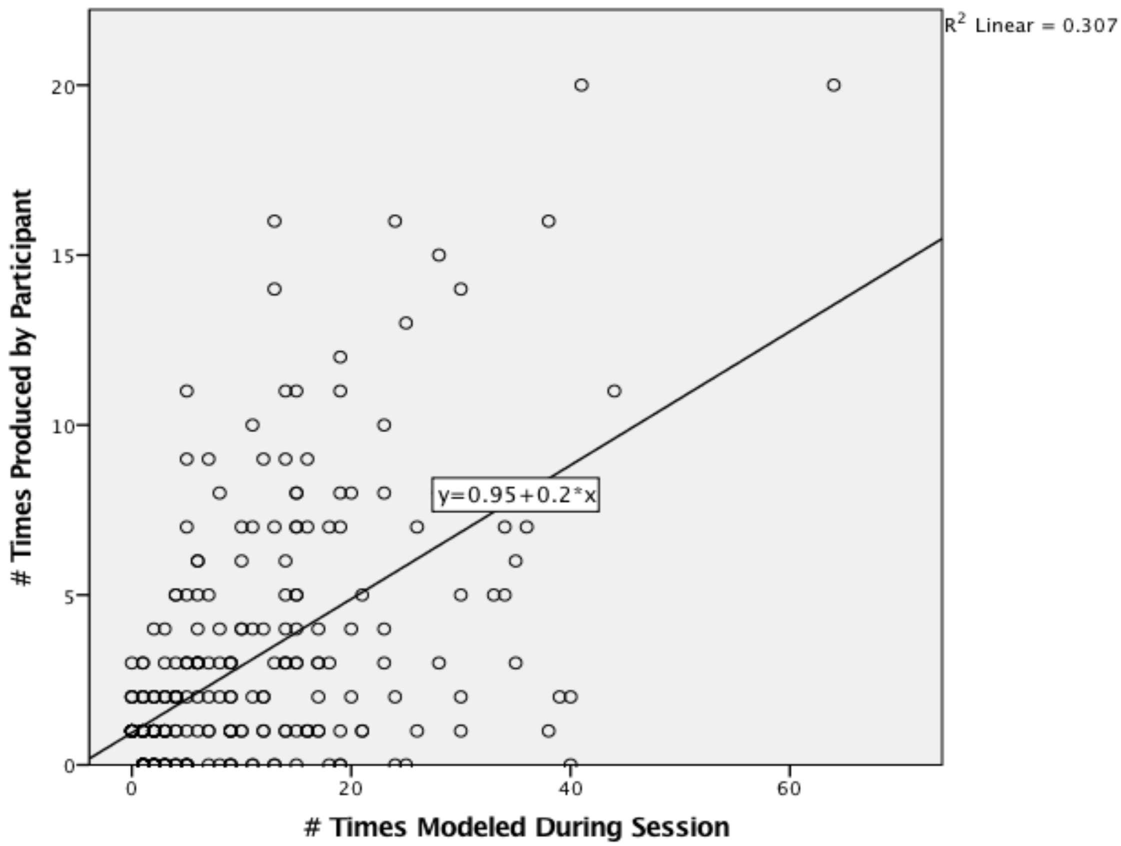

Figure 1. # of clinician models and # of times metacognitive verbs were produced by the student during any one session.

Figure 2 is a scatterplot that represents the relationship between the metacognitive verbs modeled by the clinician over the course of all of the sessions combined and those produced by the student over the course of the sessions. This Figure 2 indicates that the two variables were linearly related such that over all of the sessions, the models provided by the clinician were significantly and highly correlated with the use of metacognitive verbs by the student. The R^2 value of 0.665 indicates that 67%% of the variance in the student's use of metacognitive verbs across the course of all of the intervention session may be accounted for by the models provided by the clinician.

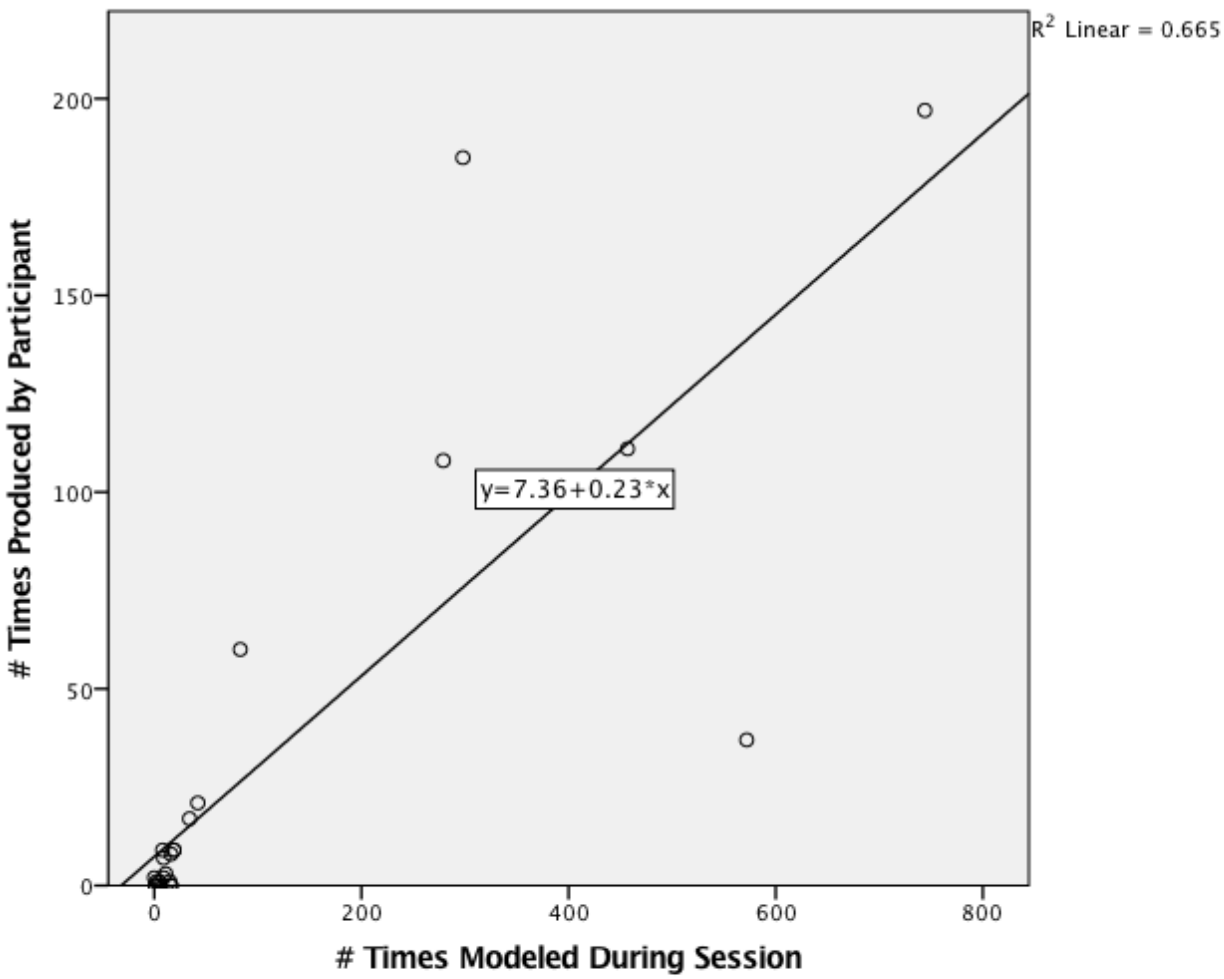

Figure 2. # of clinician models across all of the sessions and # of times metacognitive verbs were produced by the student across all of the sessions combined.

CLINICIAN MODELS TO STUDENT PRODUCTIONS BY HIGHEST AND LOWEST OCCURRENCE

To examine the correlation between modeled metacognitive verbs produced by the clinician and those produced by the student, the top five highest occurring metacognitive verbs of the examiner were selected to compare against the top five highest occurring metacognitive verbs of the student (Table 1.2). The examiner used the following metacognitive verbs in order of greatest number of occurrence to least number of occurrences: *think* (751), *remember* (572), *want* (469), *decide* (298), *know* (279). The student used the following metacognitive verbs in order of greatest number of occurrence to least number of occurrences: *think* (197), *decide* (185), *want* (111), *know* (108), *forget* (60).

Four of the five metacognitive verbs produced with the greatest number of occurrence were the same across examiner and student (*think, want, decide, know*), suggesting that the more the student heard the metacognitive verb, the more likely he was to produce the metacognitive verb. Looking at the top five metacognitive verbs used most frequently by the examiner and the student and analyzing their occurrence during each phase of intervention further demonstrates this theory. These results are shown below in Table 1.2, with E representing the Examiner and C representing the Child/Student.

Table 1.2: Metacognitive Verbs of Highest Occurrence by Phase

Metacognitive Verb	Phase I		Phase II		Phase III		Total # Occurrences	
Examiner/Child	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**
think	440	107	171	47	140	43	**751**	**197**
want	248	52	118	32	103	27	**469**	**111**
decide	156	111	74	31	68	43	**298**	**185**
know	136	48	69	44	74	16	**279**	**108**
remember	321	21	168	11	83	5	**572**	**37**
forget	61	49	13	7	9	4	**83**	**60**

E = Examiner; C = Child

As shown in Table 1.2, the more often the metacognitive verb was modeled by the examiner, the more the student produced it. For example, during Phase I the examiner modeled the metacognitive verb *think* 440 times, and the student produced it 107 times. In Phase II the examiner produced *think* 171 times, to which the student produced it 47 times. During Phase III, the examiner used *think* 140 times and the student used it 43 times. The student was much more likely to produce a metacognitive verb if it was modeled during the session than if it was not. For example, the clinician modeled the use of the word *think* 751 times during Phases I, II, and III. The student used the word after hearing it 11 times, producing the word *think* 197 times during Phases I, II, and III (Table 1.2).

Just as the more a metacognitive verb was modeled the more it was produced by the student, the opposite was true for metacognitive verbs not modeled at all or often: the less a metacognitive verb was modeled the less likely it was to be produced by the student. Table 1.3 demonstrates this relationship.

Table 1.3: Metacognitive Verbs of Lowest Occurrence by Phase

Metacognitive Verb	Phase I		Phase II		Phase III		Total # Occurrences	
Examiner/Child	E	C	E	C	E	C	E	C
concentrate	1	0	0	0	5	0	**6**	**0**
promise	2	0	1	0	1	1	**4**	**1**
hope	0	0	2	1	0	0	**2**	**1**
pretend	2	1	0	0	0	0	**2**	**1**
recognize	1	0	0	0	0	0	**1**	**0**

E= Examiner; C = Child

The metacognitive verb *promise* was modeled by the clinician 4 times during Phases I-III, and the student only produced the word after hearing it 4 times (Table 1.3). This word was only produced one time by the student, suggesting that the less the clinician modeled a word, the less the student produced the word. The only metacognitive verb produced by the student that was not modeled by the clinician during Phases I, II, or III was *believe*, produced in Phase II. The word *believe* was used twice in Phase II (sessions 21 and 22) but not used again by the student.

CLINICIAN MODELS TO STUDENT PRODUCTIONS ACROSS SESSIONS

In order to compare the number of times the clinician modeled the metacognitive verb to the number of times the student produced the metacognitive verb, ratios were calculated and are shown in Table 1.4. Some metacognitive verb ratios were higher than others. As shown in Table 1.4, *think* was modeled 751 times by the examiner, but only 197 times by the student yielding a ratio of 4:1. Similarly, *want* was modeled 469 times by the clinician, but only produced 111 times by the student which yielded a ratio of 4:1. Comparatively, *dream* was used 7 times by the student despite only hearing the metacognitive verb modeled 9 times by the clinician (ratio 1.3:1). *Wonder* was used 8 times by the student despite only hearing it 16 times (ratio 2:1). These data (Table 1.4) suggest that the student required almost twice as many models during Phase I to produce proportionally similar modeled and novel metacognitive verbs during Phases II and III.

Table 1.4: Total Number of Occurrence of Metacognitive Verbs Across Sessions

Word	Total # times modeled by clinician	Total # times used by student	Total # times word used	Ratio (Examiner; Child)
remember	572	37	609	15.5:1
think	751	197	948	4:1
know	279	108	387	2.6:1
want	469	111	580	4:1
decide	298	185	483	1.6:1
concentrate	6	0	6	6:0
understand	16	0	16	16:0
forget	83	60	143	1.4:1
plan	39	17	56	2:1
promise	4	1	5	4:1
worry	9	2	11	4.5:1
remind	15	1	16	15:1

wonder	16	8	24	2:1
dream	9	7	16	1.3:1
hope	2	1	3	2:1
believe	0	2	2	0:2
realize	13	7	20	2:1
pretend	2	1	3	2:1
recognize	1	0	1	1:0
expect	46	21	67	2:1
confuse	11	3	14	3.6:1
guess	8	9	17	.88:1
brainstorm	21	0	21	21:0
Imagine	1	0	1	1:0

THE IMPACT OF CONTEXTUAL VARIATION ON VERB PRODUCTION

We wanted to look for specific examples of how the metacognitive verb was used by both the clinician and the student in an effort to explain why some metacognitive verbs yielded higher occurrences and ratios than others (Table 1.4). For example, the metacognitive verb *think* was modeled 751 times by the clinician and produced 197 times by the student (Table 1.4). However, of these 751 times that the clinician modeled *think*, only 81 of them were used to describe the mental states of characters (e.g., “Now they had to think of another plan to find Snoopy”). The additional 670 times *think* was modeled by the clinician were part of instructions and/or teaching (e.g., “We have to think about all the parts of the story”; “Good stories should also include what the characters are thinking about saying or doing”). The student used *think* to describe characters’ mental states 48 times and used *think* 149 times when responding to instructions or teachings of the clinician.

Wonder was only modeled by the clinician 16 times but was produced by the student 8 times (Table 1.4). The clinician modeled *wonder* in the context of describing a character’s mental state 15 times, and the student used *wonder* all 8 times to describe an internal state. Similarly, *dream* was modeled by the clinician 9 times, all in the context of describing a character’s mental state. The student produced *dream* 7 times, with all 7 occurrences used to describe characters’ internal states. These data suggest that the student was more likely to produce the metacognitive verb when modeled in the context of describing a character’s mental state than when the verb was modeled as part of instructions to the student.

DISCUSSION

Children diagnosed with ASD demonstrate limited use of metacognitive verbs and an inability to determine the goals and motivations of others. It is proposed that these deficits are linked to Theory of Mind accounts, which encompass the ability to identify the motivations and causes of another individual's emotional or mental state (Capps et al., 2000; Eigsti et al., 2011). When compared to children with DS, children with ASD misinterpreted story events, did not mention central themes, and did not use metacognitive terms in their narratives (Loveland et al., 1990; Baren-Cohen et al., 1985). Children with ASD produced narratives comparable to their peers (TD) in length and grammaticality, but included few descriptions of characters' goals and motivations (Kelley et al., 2006). Narrative-based language intervention studies that focused on increasing the use of metacognitive verbs revealed positive results post-intervention in the total number of different metacognitive terms used (Dodd et al., 2011). Research findings suggest the effectiveness of incorporating the teaching of emotions with story grammar elements, as well as targeting metacognitive and causal language in a narrative intervention program (Petersen et al., 2014; Gillam et al., 2015).

The student in the current study was a participant from the parent study (Gillam et al., 2015) who made clinically significant gains in perspective taking, achieved through descriptions of characters' internal response, plan, and the use of metacognitive and linguistic verbs in his spontaneously generated narratives. In the current study we examined his use of metacognitive verbs in conversational discourse that occurred during his intervention sessions. In each phase of intervention, the participant was more likely to use a metacognitive verb that had been modeled during the session than one that had not been modeled during the session. The number of times each metacognitive verb was modeled also increased the likelihood of production by the student.

Not only was the number of times each metacognitive verb was modeled a contributing factor in increasing the likelihood of production by the student, but also the context in which the metacognitive verb was modeled. Results from the current study revealed the metacognitive verb was more likely to be produced by the student when it was modeled in the context of referring to the internal, or mental state of a character (e.g., The rabbit wondered how they would all fit). Therefore, children with ASD are likely to increase their productions of metacognitive verbs when the metacognitive verbs are modeled in context of describing characters' internal states, rather than simply used as part of instruction (e.g., Let's think about the story elements).

CLINICAL IMPLICATIONS

The data reported here represent only one participant; however, it was clear that there was a relationship between the frequency and manner in which metacognitive verbs were used by the clinician and the student. In this study, the metacognitive verbs that were modeled frequently and in the context in which they should be used were more likely to be used by the participant. Importantly, the use of the terms in instructional contexts did not appear to be related to whether the student used the terms. Only those verbs that were modeled frequently in context were used by the student to describe internal states during conversations surrounding narrative discourse. While preliminary in nature, these findings suggest that frequent modeling of the use of metacognitive verbs to describe internal states of characters may be a powerful language facilitation device to improve the use of these terms for students with ASD. More research is necessary to confirm these findings.

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APPENDICES

Appendix A. CURRICULUM VITAE

Mary Ann Hammon Stenquist
(January 2017)

EDUCATION

Utah State University, Logan, UT

Master of Science, Speech Language Pathology (expected graduation Spring 2017); GPA: 3.62

Utah State University, Logan, UT

Bachelor of Science, Communicative Disorders; GPA: 3.66

AWARDS

- Summa Cum Laude at Utah State University
- Dean's List at Utah State University

THESIS

Stenquist, M. H. (2017). The use of metacognitive verbs by a student with ASD: Marking perspective in conversational discourse during narrative intervention. Unpublished Masters thesis, Utah State University.

PUBLICATIONS

Hammon, M., Sneddon, S., Williams, M., Crotty, B., & Gillam, S. (2015). Improving the use of mental state verbs by children with Autism Spectrum Disorders in two narrative production tasks: Story retelling and spontaneous story generation. *Proceedings of The National Conference On Undergraduate Research* (NCUR), April 16-18, 2015.

CONFERENCE PRESENTATIONS

Hammon, M., & Gillam, S. L. (2016, November). The use of metacognitive verbs by a Student with ASD: Marking perspective in conversational discourse during narrative intervention. Poster presented at the annual meeting of the American Speech-Language-Hearing Association Conference, Philadelphia, PA.

Hammon, M., Sneddon, S., Williams, M., Crotty, B., & Gillam, S. (2015, February). Improving the use of mental state verbs by children with Autism Spectrum Disorders. Poster presented at the Utah Conference of Undergraduate Research, Dixie State University, UT.

RESEARCH EXPERIENCE

Utah State University – Child Language Research Lab 2014-2016

Research Assistant

- Provided research support to Dr. Sandra Gillam
- Managed team of undergraduate research assistants in data coding, analysis and interpretation

CLINICAL EXPERIENCE

Utah State University Speech-Language-Hearing Center, Logan, UT 2014-2015

Speech-Language Pathology Student Clinician

- Assessed, diagnosed, and provided speech-language services for children and adults in the following areas: receptive-expressive language, articulation, AAC, fluency, aphasia, apraxia
- Developed and executed evidence-based treatment plans

- Communicated with parents, spouses, and clients regarding treatment and home programming materials

Weber-Morgan Early Intervention, Ogden, UT 2015

- Assessed language and articulation in clients ages birth-3
- Provided education and training to parents regarding communication and language facilitation strategies

Cache Employment and Training Center (CETC) – Clinical Services 2015

Speech-Language Pathology Graduate Clinician

- Assessed and provided treatment for adults in the areas of social communication and langauge
- Collaborated with staff members to facilitate optimal therapy techniques/effective strategies
- Provided recommendations and researches to clients and their families