

MOTHERS' CONVERSATIONAL PATTERNS

MOTHERS' CONVERSATIONAL PATTERNS: A COMPARISON
BETWEEN TYPICALLY DEVELOPING CHILDREN
AND YOUNG CHILDEN WITH AUTISM SPECTRUM DISORDERS

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MOTHERS' CONVERSATIONAL PATTERNS

The undersigned, appointed by the dean of the Graduate School, have examined the thesis entitled

MOTHERS' CONVERSATIONAL PATTERNS: A COMPARISON
BETWEEN TYPICALLY DEVELOPING CHILDREN
AND YOUNG CHILDREN WITH AUTISM SPECTRUM DISORDERS

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MOTHERS' CONVERSATIONAL PATTERNS

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MOTHERS' CONVERSATIONAL PATTERNS

TABLE OF CONTENTS

Acknowledgements.....	ii
List of Tables	iv
List of Figures	v
Abstract.....	vi
Introduction.....	1
Specific Aims.....	2
Background.....	3
The Conversational Patterns of Mothers of Typically Developing Children	3
Conversational Development in Typically Developing Children.....	5
Mothers of Children With Developmental Language Delay and Their Conversational Patterns.....	8
Autism and Social Communication	11
Methods.....	15
Results.....	20
Discussion.....	27
References.....	35

MOTHERS' CONVERSATIONAL PATTERNS

LIST OF TABLES

Table	Page
1. Dyad Characteristics	16
2. Pragmatic Mother Utterances	19
3. Response Codes	19
4. Conversational Mother Utterances	20

MOTHERS' CONVERSATIONAL PATTERNS

LIST OF FIGURES

Figure	Page
1. Maternal Use of Pragmatic Structures	22
2. Conversational Responses to Questions	24
3. Conversational Responses to Commands	25
4. Maternal Use of Conversational Structures	27

MOTHERS' CONVERSATIONAL PATTERNS

Mothers' Conversational Patterns: A Comparison Between Typically Developing Children and Young Children with Autism Spectrum Disorders

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Abstract

Autism Spectrum Disorders (ASD) are a group of developmental disabilities that cause mild to severe deficits in language, verbal and nonverbal communication, and social skills (Individuals With Disabilities Education Act, 2004). Given the social nature of conversation and the deficits in social skills seen in ASD, one might expect the development of conversation to be more delayed than other language deficits. Previous research on typically developing children has shown that differences in maternal utterances and conversational structure alter the nature of interactions in ways that appear to affect children's acquisition of language. The present study investigates the maternal pragmatic and conversational input to children with ASD, particularly the types of utterances (i.e., questions and commands) and the conversational structure produced. The children's responses to the mothers' questions and commands were also examined. Mothers of children with ASD produced significantly more commands than mothers of typically developing children matched by age or language level. The structure of mothers' conversational input also varied by group: mothers of children with ASD produced significantly more topic continuations than mothers of age-matched children. The results contribute to our knowledge of maternal language input to children with ASD.

Introduction

Autism Spectrum Disorders (ASD) are a group of developmental disabilities that cause mild to severe deficits in language, verbal and nonverbal communication, and social skills (Individuals With Disabilities Education Act, 2004). All of these domains are important for engaging in conversation. Conversation requires linguistic knowledge such as syntactic and semantic knowledge, the ability to adjust language to the situation or listener, and the ability to follow conventions of turn-taking and contingent responding (American-Speech-Language-Hearing Association [ASHA], 2012). In addition, conversation is inherently social as it involves a communication exchange between two or more participants. Thus, to fully understand and treat ASDs, it is important to understand the nature and development of conversation in children with ASD.

The development of conversational skills begins early for typically developing children. They learn to utilize various components of conversation including turn-taking, topic initiation, and topic maintenance (Bloom, Rocissano, & Hood, 1976; Wellman & Lempers, 1977; Kaye & Charney, 1981). Maternal input plays a significant role in children's development of language, including conversation (McDonald & Pien, 1982; Hoff-Ginsberg, 1985; Yoder & Kaiser, 1989). In early infancy—long before children become verbal—mothers use questions as if to elicit conversation, and they treat any vocalization, including cooing, babbling, and vegetative sounds, as a conversational turn (Snow, 1976). Although the majority of research on this topic was conducted in the 1970s and 80s, the findings remain relevant to our understanding of children's conversational development. Because differences in maternal responsiveness and conversational

MOTHERS' CONVERSATIONAL PATTERNS

structure alter the nature of interactions in ways that affect typically developing children's acquisition of language (Gilmore, Cuskelly, Jobling & Hayes, 2009), these differences might also affect their acquisition of conversational skills. Possibly, children with ASD receive different language input to their deficits in language, verbal and nonverbal communication, and social skills. These deficits may impact the ways that mothers interact with their children with ASD. Therefore, it is important to examine these interactions and their impact on child language development.

While their deficits in word-learning and syntax are clear, very little is known about the emergence of conversation in children with ASD. Given the social nature of conversation and the deficits in social skills seen in ASD, one might expect the development of conversation to be more delayed than other language deficits. In addition, no work examines the nature of maternal input relevant to modeling or eliciting conversation with children with ASD. The results of the present study will contribute to our understanding of the conversational structures used by mothers when talking to their children with ASD. The conversational input of mothers of children with ASD may differ from mothers of typically developing children because of the children's deficits in language and/or social skills.

Specific Aims

This study investigates the pragmatic and conversational structures that mothers produce when speaking to their toddlers with ASD as well as examining the toddler's conversational turns. This study addresses three specific questions:

MOTHERS' CONVERSATIONAL PATTERNS

1. Data from typically developing children have revealed that maternal questions promote the development of conversation while the use of commands may hinder it. Do mothers of children with ASD produce these questions and commands similarly to mothers of typically developing peers?
2. What is the nature of the conversational turns of very young children with ASD as compared to typically developing peers? How do children respond to their mothers and do mothers give their children an opportunity to take a turn?
3. Is the structure and length of a conversational episode similar between mothers who are speaking to their toddlers with ASD and mothers who are speaking to their typically developing toddlers?

Background

The Conversational Patterns of Mothers of Typically developing Children

A mother's language input can significantly impact her child's language development. For example, the amount of vocabulary that mothers direct toward children is positively correlated with children's vocabulary development (Hart & Risley, 1995). Mothers' communicative style also appears to impact the children's language development, especially the development of conversation. Questions and commands are both common in maternal speech to children (age 1; 9 to 2; 6) with questions making up nearly a third of child-directed speech (CDS) and commands making up nearly a tenth of CDS (Cameron-Faulkner, Lieven, & Tomasello, 2003). However, these two utterance types affect conversational development differently. McDonald & Pien (1982) found that

MOTHERS' CONVERSATIONAL PATTERNS

mothers who produce frequent questions elicit conversation, while mothers who produce frequent commands, trying to direct the behavior of their child (age 2; 5 to 3; 0), do not elicit conversation to the same extent. Additionally, they found a negative correlation between mothers' overall use of questions and commands. That is, the more questions a mother asks, the fewer commands she uses and vice versa. This suggests that mothers may have a "style" of interaction. This style could foster or hinder the development of conversational skills in children. Indeed, the use of questions is positively correlated with the child's language acquisition in Brown's Stage 1 (Yoder & Kaiser, 1989), and the use of commands is negatively associated with language development in children (age 2; 1 to 3; 1) (Gilmore, et al, 2009). In addition, the structures used in CDS that elicit conversation benefit the syntactic development of typically developing (TD) children (age 2; 6): Mothers' use of wh- questions is positively correlated with the child's use of auxiliaries four months later (Hoff-Ginsberg, 1985). While these findings do not show that the use of syntactic structures that elicit speech *causes* language development, it is plausible that the structures that require children to verbally respond facilitate faster language development.

Mothers' style of interaction may also be shaped by their child's language skill. For example, children's ability to maintain a single topic over multiple utterances may influence the types of utterances a mother makes. Maternal input related to topic maintenance changes with the child's age (and, presumably, language level). Mothers produce many topic initiations and fewer utterances that maintain a topic when speaking to younger children (age 2; 5 to 3; 0) (McDonald & Pien, 1982). This may be the result of younger children's limited ability to maintain attention to one topic for an extended

MOTHERS' CONVERSATIONAL PATTERNS

amount of time. Although mothers of young children (age 1; 7 to 2; 8) initiate more topics, Hoff-Ginsberg (1987) found that children are more likely to respond to mothers' speech when it continues a current topic of conversation rather than when it initiates a new topic. No one has examined the specific child factors (age, cognitive or linguistic development) that lead mothers to switch or maintain topics.

In sum, when speaking with their TD children, mothers tend to produce the type of utterances (i.e., questions) that encourage conversational turns. As children get older, mothers tend to model topic maintenance. Thus, the conversations that mothers engage in with their children may provide the framework that children use to develop their conversational competence. We now turn to children's development of conversation, and in particular, how they learn to take conversational turns, respond with contingent turns that maintain the conversational topic, and initiate conversational topics.

Conversational Development in TD Children

In order to be successful in conversation, children must learn to take turns, stay on topic, and appropriately initiate a new topic. They learn that in order to take turns, only one person can speak at a time, and one person should speak after the other person has spoken. Already at 3 months of age, mothers and infants alternate their vocalizing as they interact, a pattern that resembles a turn-taking exchange (Stern, Jaffe, Beebe, & Bennett, 1975). When this alternating pattern of vocalizing is present, 3-month-old infants produce a greater number of speech-like vocalizations than non-speech-like vocalizations (Bloom, Russell, & Wassenberg, 1987). This suggests that even very young infants may "imitate" the adults' verbal responses during a turn-taking exchange or that the turn-taking exchange may increase infant arousal, thereby increasing their production of speech-like

MOTHERS' CONVERSATIONAL PATTERNS

vocalizations. As children become verbal, they give cues to their conversational partners regarding turn-taking: during the age range of 12 to 24 months, children participate in turn-taking, looking up at their mothers at the end of their turns more often as they reach the end of this age range (Rutter & Durkin, 1987). This look signals to the conversational partner that the conversational turn is over. By 21 months, when mothers and children are interacting, the majority of children's speech is adjacent to maternal speech (Bloom, Rocissano, & Hood, 1976). Adjacent speech occurs directly after another speaker's utterance, without interrupting, and comprises a conversational turn. Thus, as children begin to produce a larger vocabulary and word combinations, they also are able to produce more conversational turns.

As children improve their turn-taking, they learn that their responses should be relevant to the current topic of conversation. These are referred to as contingent responses. Contingent responses serve to maintain the flow of the conversation. Bloom et al. (1976) found that children's contingent speech increased from 21 to 36 months of age. Children produced contingent speech 56% of the time at MLU Stage 1 (about 21 to 26 months of age in this study), 67% of the time at MLU Stage 2 (about 27 to 30 months of age), and 76% of the time at MLU Stage 5 (about 31 to 36 months of age). Kaye and Charney (1981) noted that contingent responses should not only stay on topic, but should also elicit a response from the other person. They referred to these contingent responses as turnabouts. When Kaye and Charney looked at conversations between mothers and their 2-year olds, they found that the majority of the mothers' responses were turnabouts. However, the 2-year olds tended to either respond or question, but not both in the same turn. In other words, by the age of 2, children are capable of replying to greetings, yes/no

MOTHERS' CONVERSATIONAL PATTERNS

questions, commands, and offers, but they have not developed the ability to both acknowledge the conversational partner's statement and relate their own responses to the partner's statement. Thus, at the age of 2, children are poor at topic maintenance in that they respond contingently, but they do not produce turnabouts. As children's language skills improve, they can make more relevant contributions that also facilitate the continuation of the conversation.

As children begin to verbally and nonverbally communicate with caregivers, they develop the ability to initiate conversational topics. Initiating conversation involves getting the attention of the conversational partner and then directing the attention of the partner. Children learn to initiate a communicative exchange at a very young age, enabling them to communicate their wants and needs. By the age of 2, children use both verbal and nonverbal means to gain the attention of both peers and adults (Wellman & Lempers, 1977). Martlew (1980) found that 3-year-old children initiated topics more frequently than their mothers. However, this topic initiation decreased with age, probably because children became more proficient at topic maintenance.

As children get older, they process input more efficiently and formulate contingent responses with greater speed. The evidence for this comes from a decrease in children's utterances that interrupt mothers' utterances. According to Tice, Bobb, and Clark (2011), the time it takes children to initiate a response to questions gradually reduces from ages 1;8 to 3;4. When a turn is skillfully timed, it does not overlap or interrupt the speech of the conversational partner or partners. Ervin-Tripp (1979) found that because children's processing of conversation is slow, their responses are delayed. By the time young children have processed their mother's utterance and formulated a

MOTHERS' CONVERSATIONAL PATTERNS

response, the mother might have started another topic. Therefore, the child's response is often an interruption. Ervin-Tripp found that across subjects, two-year olds produced 27-55% delayed responses whereas four-year olds produced only 9-22% delayed responses. Younger children have a harder time monitoring the ongoing conversation of others, while formulating what they want to say. The delayed responses, or interruptions, decrease with age as the children become more able to process language and take a turn at the appropriate time.

To summarize, children already appear to be skilled turn-takers as they begin to speak their first words, and caregivers help to foster this skill by providing structure. Although children learn to take turns early on, they do not learn to produce on-topic turns until much later. With age, children become more skilled at timing their turns, avoiding interruptions, and producing responses related to the current topic of conversation.

While TD children follow this course of conversational development, children with developmental language disorders (DLD) and ASD may not follow this typical pattern of development. Furthermore, the conversational input that mothers provide to their children with DLD and ASD may differ from the input that mothers of TD children provide.

Mothers of Children With DLD and Their Conversational Patterns

Few studies have investigated conversational input to children with ASD, but several studies have examined the nature of conversational input to children who have developmental language delays or disorders without accompanying social deficits. These studies have investigated the relationship between the child's language deficit and maternal input. The conversational input of mothers of children with a language disorder

MOTHERS' CONVERSATIONAL PATTERNS

and mothers of children with ASD can be compared to differentiate the impact of a language disorder generally from the impact of the pragmatic and joint attention deficits associated with ASD.

The population of children with DLD is heterogeneous, resulting in varied, and sometimes conflicting, experimental findings. Some studies of DLD involve children under the age of 4-years old who exhibit slow early language development (SELD) without a condition that readily explains it (Hedge & Maul, 2006). After the age of 4, some children have caught up to the language level of their peers (Late-Bloomers) and some children exhibit a continued delay (i.e., children with Specific Language Impairment) (e.g., see Hedge & Maul, 2006, for a discussion). Several studies have reported conflicting results regarding maternal question use and communicative style with children with DLD. Cunningham, Siegel, van de Spuy, Clark, and Bow (1985) reported that mothers of children with DLD who had poorer receptive language skills used more direct commands than mothers of TD children and mothers of children with poorer expressive language skills. Conti-Ramsden & Friel-Patti (1983) found no differences in the overall questions and commands used by mothers of children with DLD and mothers of TD children who were matched by MLU to the children with DLD. Rescorla, Bascome, Lampard, and Feeny (2001) found that mothers of children with DLD with normal receptive language asked more questions than mothers of TD children who were matched by age, SES, and nonverbal ability. These mixed findings suggest that the mothers of children with DLD may utilize different communicative behavior depending on their children's receptive language skills.

MOTHERS' CONVERSATIONAL PATTERNS

Additional evidence supports the conclusion that mothers of children with DLD adapt their conversational style to the language ability of their children. For example, Conti-Ramsden, Hutcheson, and Grove (1995) found that mothers of children with DLD produced fewer simple recasts (i.e., expansions of the child's utterance) than mothers of TD children. These recasts add semantic, syntactic, and morphological information to the child's previous utterance (Paul, 2007) and their use has been associated with facilitating child language development. Additionally, the mothers of children with DLD used recasts to make requests for clarification and response. In contrast, mothers of MLU-matched children with DLD used recasts to make requests for information, assertions, and commands (Conti-Ramsden, 1990). That is, mothers of children with language delay produced different types of recasts than mothers of TD children. In sum, mothers of children with DLD produce fewer recasts, and their recasts generally serve a different purpose.

Mothers of children with DLD also adapt their conversational style when taking turns in conversation and maintaining the conversational topic. A longitudinal study across 18 months compared the conversational behavior of mothers and their 2- to 3-year-old children with DLD to the conversational behavior of mothers and their age-matched TD children (van Balkom, Verhoeven, & van Weerdenburg, 2010). They found that the length of the conversational episode of the mothers of children with DLD was significantly shorter than mothers of TD children. This means that the mothers spent less time building a coherent conversation regarding a shared interest, and more time trying to initiate a topic of interest. Furthermore, as children with DLD got older, their mothers used fewer verbal topic initiations. Thus, mothers may be using more nonverbal topic

MOTHERS' CONVERSATIONAL PATTERNS

initiations, adapting to their children's language level over time. Overall, the conversations between mothers and their children with DLD were shorter and consisted of more nonverbal topic initiations initiated by the mother than the conversations of mothers and their TD children.

The conversational style of mothers of children with DLD may be compared to the conversational style of mothers of children with ASD, because children with ASD also exhibit a language delay. However, the conversational style of mothers of children with ASD may be further impacted by their children's deficits in social communication.

Autism and Social Communication

One might expect conversation to be especially delayed in children with ASD. Children with ASD exhibit deficits in social communication skills, such as joint attention and social reciprocity, which are considered prerequisites for language development (ASHA, 2006). Joint attention refers to when a child attends to and shares a communication partner's gaze direction, gestures, and facial expression. Children with deficits in joint attention have difficulty attending to a shared item of interest and exchanging information relating to that item. Social reciprocity behaviors consist of taking contingent turns that provide relevant information, and maintaining the conversational exchange by requesting information. Children with deficits in social reciprocity have difficulty with gesture use, turn-taking, and repairing breakdowns during a communication exchange. When children have deficits in social communication, the conversational exchange is a challenge for the conversational partner.

Given their children's severe social deficits, mothers of children with ASD may modify their conversational behavior to facilitate effective communication. One way to

MOTHERS' CONVERSATIONAL PATTERNS

examine whether mothers of children with ASD alter communication in specific response to their children's social deficit, and not their language deficit, is to compare interactions of mothers of children with ASD to mothers of children with Down Syndrome (DS).

Venuti, de Falco, Esposito, Zaninelli, and Bornstein (2012) compared the conversational speech of 20 mothers of children with DS (age 2;4 to 4;0), 20 mothers of children with ASD (age 2;6 to 7;4), and 20 mothers of TD children (age 1;7 to 2;7), matched by developmental age. The Bayley Scales of Infant and Toddler Development assessed the developmental age of the children with ASD and DS. The developmental age of the TD children was assessed through parent interview, observations, and IQ scores on the WPPSI. The experimenters collected a 10-minute sample of the mother and child interacting during free play with a standard set of toys. Mothers of children with ASD called their children by name more than mothers of TD children; however, mothers of children with DS were in the middle and did not significantly differ from the two groups. Another finding was that mothers of children with ASD may name their children more often in order to redirect or recruit joint attention. Joint attention is a necessary component for the continuation of a conversational topic. Mothers of children with ASD and DS used more commands and asked fewer questions than mothers of TD children. That is, mother of children with ASD and DS adopted a style of conversation that may be less facilitative to children's conversational development by directing behavior rather than attempting to elicit a child's responses through question use. Differences between mothers of children with ASD and DS may be the result of the social communication deficits of children with ASD; similarities between mothers of children with ASD and DS may be the result of the children's language impairment.

MOTHERS' CONVERSATIONAL PATTERNS

Mothers of children with ASD may also modify their conversational style to initiate and regulate joint attention. Adamson, McArthur, Markov, Dunbar & Bakeman (2001) compared the ways in which 9 mothers of verbal children with ASD (age 25.7 to 44 months) and 9 mothers of TD children (age 18.9 to 21.4 months) gain their children's attention. The experimenters chose to observe 20-month old TD children in the comparison group, because these children would already be able to engage in joint attention to objects and people. The mother-child dyads were observed during six scenes, lasting 5 minutes each. The scenes were designed to elicit different interactions between the mother and child including "shared commenting," "social interacting," and "requesting." Overall, the mothers used a similar proportion of attention regulating attempts during various interactions. However, their style of attention regulation differed. Compared to mothers of TD children, mothers of children with ASD used more tactile and kinesthetic means, in addition to words and points, to draw their children's attention to the object of interest during a "social interacting" exchange. Taken together with Venuti et al.'s (2012) finding that mothers of children with ASD call their child by name more frequently, the findings suggest that mothers of children with ASD are working harder to secure joint focus during interactions.

Mothers' interaction style and ability to engage their children in joint attention affect children's communication abilities later in life. In a longitudinal study, Siller and Sigman (2002) compared the way in which 25 mothers of children with ASD (mean age 50.3 months), 18 mothers of children with developmental delay (mean age 46.1 months), and 18 mothers of TD children (mean age 21.8 months) followed their children's direction of attention. Half of the children with developmental delay had Down

MOTHERS' CONVERSATIONAL PATTERNS

Syndrome and the other half had unspecified etiologies. The TD children and the children who were developmentally-delayed were matched to the children with ASD by their mental and language age. The researchers then looked at the children's communication and joint attention skills 1, 10, and 16 years later to see if these skills correlated with the mothers' ability to follow their children's focus of attention. The study found that mothers of children with ASD followed their children's direction of attention as much as the mothers of children with developmental delay and the mothers of TD children. The mothers of children with ASD, who followed their children's attention more had children with better communication skills 1, 10, and 16 years later. Thus, mothers who followed their children's lead and discussed the object of their children's attention using "nondemanding" language may have an impact on their children's language development. Perhaps mothers' conversational behavior and use of "nondemanding" language reflects their children's ability to engage in joint attention.

The present study will examine the types of utterances (i.e., questions and commands) produced by mothers of children with ASD and the structure and length of their conversational episodes. I will compare the input of mothers of children with ASD to that of mothers of TD age- and language-matched children. In addition, children's responses to their mother's commands and requests will be examined. This study will contribute to the understanding of maternal conversational behavior with children with ASDs.

Methods

Participants: Fourteen mother-child dyads participated in this study. These dyads were recruited through Missouri First Steps referrals and an e-mail announcement distributed to the students and faculty at the University of Missouri. The fourteen dyads comprised three groups. One group consisted of five dyads in which the children were diagnosed with Autism Spectrum Disorders (ASD group). A physician or psychologist who was independent of this study diagnosed these children according to *DSM-IV* criteria. Each child in the ASD group was matched with two other children, one matched by chronological age (age-matched [AM] group) and the other matched by language ability (language-matched [LM] group). Children in the LM group were matched to the children in the ASD group according to MLU, which was calculated from the transcribed mother-child interactions. When the children's MLU was 0, the children were matched according to their scores on the *MacArthur-Bates Communication Development Inventories (CDI-II; Fenson et al., 1993)*. The *CDI-II* was a parent report measure, requiring parents to provide information about their children's communication ability.

The education levels of the mothers in the study varied. The mothers of children with ASD had education levels ranging from a high school diploma to post-baccalaureate work, the mothers of AM children had attained either a bachelor's degree or a graduate/professional degree, and the mothers of LM children had all attained bachelor's degrees. The children in the ASD and AM groups ranged in age from 21- to 32-months-old (mean age: 28 months). The AM children were no more than one month apart in age from their match in the ASD group. The children in the LM group ranged in age from 8-

MOTHERS' CONVERSATIONAL PATTERNS

to 33-months-old (mean age: 18 months). All of the children were boys. At this time, we have not recruited a language-matched participant for the final child in the ASD group.

Participant characteristics are presented in Table 1.

Table 1: Dyad Characteristics

	Age (Months)	Child MLU	Total Child Utterances	CDI Words Produced	Mother MLU	Total Mother Utterances	Mother Utterances/Minute
AM01 ^a	21	1.27	117	150/680	3.51	407	12.42
LM01 ^b	10	1.0	1	5/396	3.77	631	16.91
ASD01 ^b	21	1.0	3	2/396	4.27	450	13.47
AM02 ^a	31	2.38	280	519/680	4.13	232	12.07
LM02 ^b	8	0	0	0/396	3.35	865	18.81
ASD02 ^b	30	1.0	8	0/396	4.25	256	15.75
AM03 ^a	28	1.89	390	210/680	3.21	347	20.59
LM03 ^c	33	2.52	341	N/A	4.44	513	25.03
ASD03 ^a	28	2.46	302	676/680	5.44	751	25.20
AM04 ^a	32	2.34	170	614/680	4.13	307	18.00
LM04 ^a	22	1.47	216	341/680	4.12	561	22.33
ASD04 ^a	32	1.57	135	195/680	3.33	914	30.21
AM05 ^c	31	2.28	338	N/A	4.08	495	26.19
ASD05 ^c	29	1.59	407	N/A	2.72	350	32.58

^a Mothers completed the *MacArthur Communicative Development Inventory: Words and Sentences*

^b Mothers completed the *MacArthur Communicative Development Inventory: Words and Gestures*

^c Mothers did not complete the *CDI-II*

Procedure: Each dyad was videotaped at home for an hour-long session. During the sessions, mothers engaged in typical play activities while interacting with their children for about 30 minutes. This procedure provided a sample of spontaneous interactions during play activities. Following these interactions, mothers participated in a brief interview with the experimenter. Mothers were asked to determine the naturalness of the play interaction, describe a typical day for their child, and discuss their own

MOTHERS' CONVERSATIONAL PATTERNS

education and profession. All of the mothers stated that their interactions were natural. The analysis in this thesis includes the free play interaction only.

The mother-child interactions were transcribed from videotapes using the Codes for the Human Analysis of Transcripts (CHAT) system (MacWhinney, 2000). The types of mothers' utterances directed toward the children were coded using the Dyadic Parent-Child Interaction Coding System (DPICS) (Eyberg, McDiarmid Nelson, Duke, & Boggs, 2009). We used DPICS to code mothers' utterances as descriptive questions, information questions, direct commands, and indirect commands. Following DPICS coding instructions, descriptive questions were coded as utterances that required a simple affirmative or negative response, and the information questions were coded as utterances that asked for specific information. Direct commands were utterances that required for a behavior to be performed and indirect commands were utterances that suggested for a behavior to be performed. This coding scheme is summarized in Table 2.

We also used and adapted DPICS response codes to determine how the children verbally and nonverbally reacted to their mothers' questions and commands. For descriptive and information questions, the response codes marked whether the children answered, did not answer, or were not given the opportunity to answer by their mothers. For direct and indirect commands, the response codes marked whether the children complied, did not comply, or were not given the opportunity to comply by their mothers. The DPICS guidelines allow 5 seconds for the children to answer a question or comply with a command. We coded the child's response as "not given the opportunity to respond," if the mother did not wait 5 seconds for a response before producing another utterance. This coding scheme is summarized in Table 3.

MOTHERS' CONVERSATIONAL PATTERNS

We also developed a coding scheme to categorize mothers' utterances for conversational components: topic initiations, topic continuations, volleys, non-contingent turns, and topic interruptions. Topic initiations are defined as utterances that begin a new conversational episode; topic continuations are consecutive turns produced by the same speaker that maintain the topic of the conversational episode; volleys are utterances that respond to the conversational partner's preceding utterance; non-contingent turns are utterances that occur when one conversational partner speaks after the other partner, but the content of the utterance is not relevant to the partner's utterance; and topic interruptions are one to three utterances that stray from the current topic when a subsequent utterance returns to that topic. These codes are mutually exclusive and summarized in Table 4. For each session, we measured the number and length of conversational episodes. The length of a conversational episode is the number of utterances by both individuals that the conversation remains on a single topic (topic initiation to topic initiation).

Two undergraduate research assistants and the primary researcher completed the DPICS coding. Inter-rater reliability was calculated for 10% of each video. The reliability for pragmatic mother utterances between coders was 95% and the reliability for response coding between coders was 92%. Two different undergraduate researchers and the primary researcher completed coding for the mothers' conversational utterances. The reliability for conversational utterances was 92%. Of the discrepancies between raters, 39% were disagreements between non-contingent turns and volleys.

MOTHERS' CONVERSATIONAL PATTERNS

Table 2: Pragmatic Mother Utterances

DPICS Maternal Utterances	Examples
Descriptive Questions (DQ)	MOT: he's a big one, isn't he? (DQ) MOT: do these guys fit? (DQ) MOT: is that an elephant? (DQ) MOT: oh being shy? (DQ) (i.e., statement syntax with question intonation)
Information Question (IQ)	MOT: what did you catch? (IQ) MOT: where's Noah? (IQ) MOT: who is this? (IQ) MOT: is it this one or this one? (IQ)
Direct Command (DC)	MOT: get ready. (DC) MOT: look at mommy. (DC) MOT: you better give me that nose. (DC)
Indirect Command (IC)	MOT: can you look at mommy? (IC) MOT: let's do the fish puzzle. (IC) MOT: can you give me five? (IC)

Table 3: Response Codes

DPICS Child Responses	Examples
Answer (AN)	MOT: what color is it? (IQ/AN*) CHI: blue. *Child answers within 5 seconds of the question
No Answer (NA)	MOT: do you want that book? (IQ/NA*) MOT: bring it here. (DC/C) *Child does not answer within 5 seconds of the question
No Opportunity for Answer (NOA)	MOT: What do you want to do now? (IQ/NOA*) MOT: do you want to read a book? (IQ/AN) *Mother does not allow 5 seconds for the child to answer before asking the next question
Compliance (C)	MOT: oh put this one in. (DC/C*) MOT: pop them. (DC/C*) *Child complies within 5 seconds of the command
No Compliance (NC)	MOT: knock it down. (DC/NC*) *Child does not comply within 5 seconds of the command
No Opportunity for Compliance (NOC)	MOT: come on. (DC/NOC*) MOT: do it with mommy. (DC/NOC*) MOT: come on. (DC/NOC*) *Mother does not allow 5 seconds for the child to comply before giving the next command

MOTHERS' CONVERSATIONAL PATTERNS

Table 4: Conversational Mother Utterance

Maternal Utterances	Examples
Topic-Initiation (TI)	MOT: keys (C) MOT: look at this. (i.e., initiates a new topic by referring to blocks) MOT: Can we stack? (C)
Continuation (C)	MOT: look at this. (TI) MOT: Can we stack? (i.e., continues to talk about blocks) MOT: Can you make it high? (C)
Volley (V)	CHI: that a puppy. MOT: that's not a puppy. (V)
Non-Contingent Turn (NCT)	CHI: uhoh. MOT: Come here. (i.e., mother does not acknowledge the child's verbalization, but does not initiate a new topic).
Topic Interruption (I)	MOT: where's my happy home? (TI) MOT: Can you do happy home? (C) MOT: yup, mangos. (I) MOT: ready? (C) MOT: happy home. (C)

Results

The data resulting from DPICS and conversation coding were evaluated using both statistical and qualitative analyses. First, we calculated the total number of pragmatic mother utterances, response codes, and conversational mother utterances for each video using the Codes for the Human Analysis of Transcripts (CHAT) system (MacWhinney, 2000). We also calculated the total number of utterances, MLU of each participant, and the mothers' utterances per minute using the CHAT system. The average episode length was the total number of utterances divided by the number of mother and child topic initiations. Then, the totals of each type of utterance and the average episode length for each dyad were used to perform tests of significance comparing the mothers of children with ASD to the mothers of language-matched children and the mothers of age-

MOTHERS' CONVERSATIONAL PATTERNS

matched children. Using the R Project for Statistical Computing, a free statistical computing program, comparable to SPSS and SAS, the Shapiro-Wilk test of normality was performed to determine whether the data were normally distributed. If the data were normally distributed, *t-tests* were used to determine statistical significance. If the data were not normally distributed, the nonparametric Wilcoxon Rank Sum test was used to determine statistical significance. A *p*-value of .05 was used as the cutoff score for statistical significance. Few statistically significant differences were found in the dataset, possibly due to the small sample size of the study. Therefore, qualitative analyses are also presented. That is, due to the small N, for all questions below, we present descriptive results and note when findings are significant.

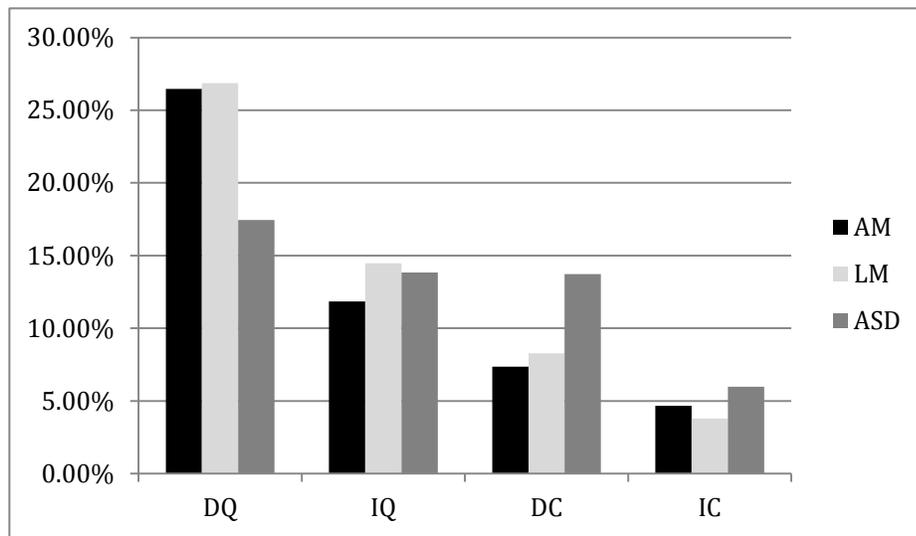
1. Do mothers of children with ASD produce questions and commands similarly to mothers of TD peers?

The first question of our specific aims addresses whether mothers of children with ASD use questions and commands in the same ways as mothers of TD peers. There were no statistically significant differences in the mothers' use of questions among the three groups. In accordance with previous research, the mothers produced a large percentage of questions. Descriptively, mothers of children with ASD produced questions 31% of the utterances, mothers of LM children produced questions 41% of the utterances, and mothers of AM children produced questions 38% of the utterances (Figure 1). In all three groups, mothers produced more descriptive questions than information questions. Overall, mothers of children with ASD produced fewer questions than mothers of TD children. Mothers of children with ASD produced a similar proportion of information questions as mothers of AM and LM children, but fewer descriptive questions.

MOTHERS' CONVERSATIONAL PATTERNS

Mothers of children with ASD produced a greater proportion of commands (20%) than mothers of LM (12%) and AM children (12%). This difference was most pronounced on direct commands (ASD group: 14% of the utterances, LM group: 8%, AM group: 7%). In fact, statistical analyses revealed that mothers of children with ASD produced significantly more direct commands than mothers of AM ($t(5)=3.80, p < .007$) and LM children ($W(n_1=5, n_2=4)=16, p < .006$). These results are shown in Figure 1.

Figure 1: Maternal Use of Pragmatic Structures



The percentage of mother utterances that were descriptive questions (DQ), information questions (IQ), direct commands (DC), and indirect commands (ID).

2. *What is the nature of the conversational turns of very young children with ASD as compared to TD peers? How do children respond to their mothers' and do mothers' give their children an opportunity to take a turn?*

The second question of our specific aims addresses whether the children with ASD respond to their mothers' conversational turns in the same ways as TD children. The response coding revealed that children in the AM group answered their mothers' questions more often than the children in the other groups. Children in the AM group answered significantly more descriptive questions than the children with ASD ($W(n_1=5,$

MOTHERS' CONVERSATIONAL PATTERNS

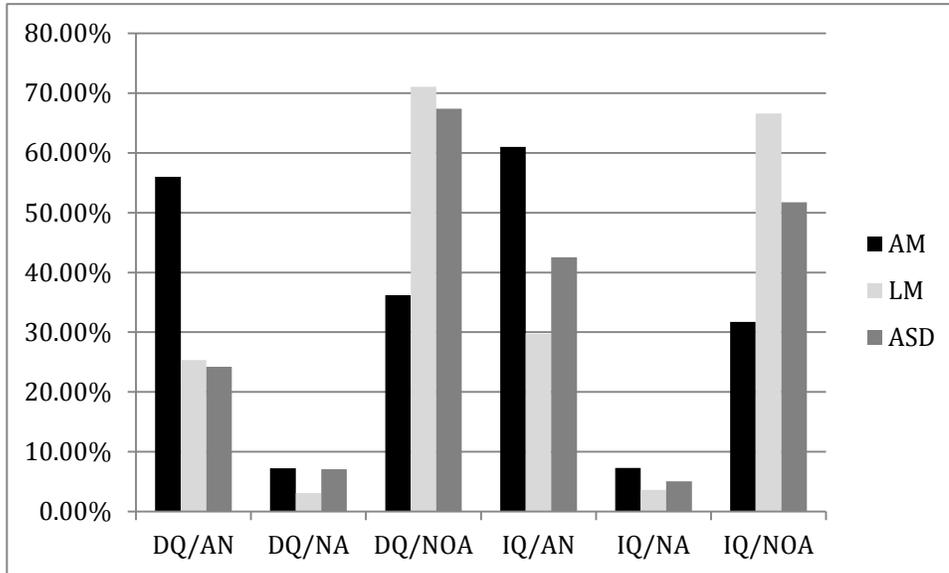
$n_2=5$)=4, $p < .047$). Children in the ASD and LM group answered descriptive questions similarly (24% and 25% respectively), but the children in the ASD group answered information questions more often than the children in the LM group (ASD group: 43%; LM group: 30%). The AM children complied with their mothers' direct commands significantly more often than the ASD group ($t(5)=2.07$, $p < .045$). Children with ASD complied with their mothers' direct and indirect commands similarly to the LM children. These results are represented in Figure 2 and Figure 3.

The second specific aim also addresses whether mothers of children with ASD give their children the opportunity to respond to questions and commands in conversation as often as the mothers of TD children. Children in the ASD group and the LM group were given the opportunity to answer descriptive questions similarly (31% and 28% respectively). In other words, mothers in the ASD and LM groups were more likely to produce follow-up utterance within five seconds of their first utterance, ending an opportunity for their children to respond. When mothers asked information questions, children in the LM group were given fewer opportunities to answer than children in the ASD group (33% and 47% respectively); children in the ASD group were given significantly fewer opportunities to answer than children in the AM group (68%) ($t(4)=2.20$, $p < .043$). Similarly to answering questions, children in the LM and ASD groups were given fewer opportunities to comply with commands than children in the AM group. For direct commands, LM children, children with ASD, and AM children were given the opportunity to comply 51%, 53%, and 75% of the time respectively. For indirect commands, LM children, children with ASD, and AM children were given the opportunity to comply 37%, 38%, and 67% respectively. The children in the AM group

MOTHERS' CONVERSATIONAL PATTERNS

complied with their mothers' direct and indirect commands more often than the children in the LM and ASD groups. So, there were fewer instances where the mother provided a follow-up utterance before the child had the opportunity to comply (i.e. "no opportunity for compliance"). These results are represented in Figure 2 and Figure 3.

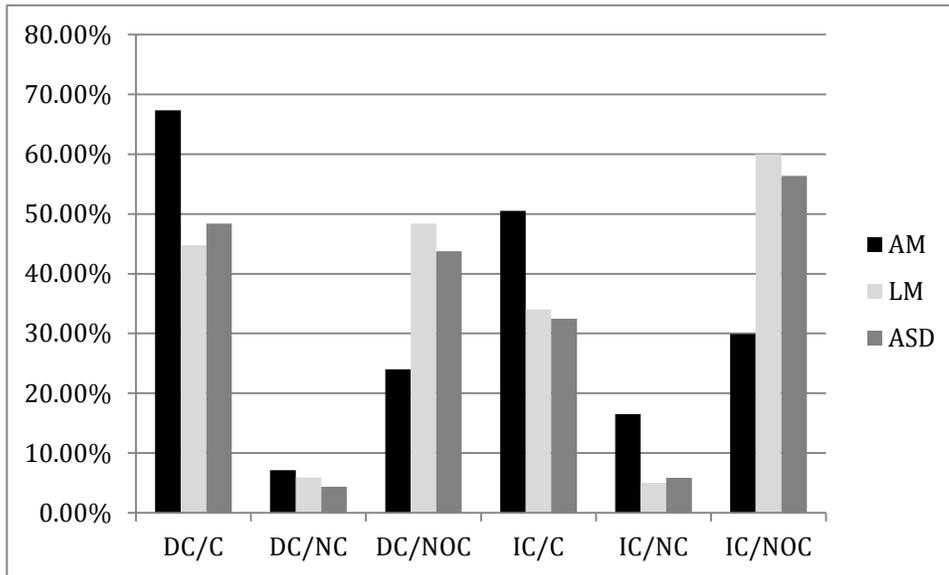
Figure 2: Conversational Responses to Questions



The percentage of responses to descriptive and information questions that were Answer (AN), No Answer (NA), or No Opportunity for Answer (NOA)

MOTHERS' CONVERSATIONAL PATTERNS

Figure 3: Conversational Responses to Commands



The percentage of responses to direct commands and indirect commands that were Compliance (C), No Compliance (NC), or No Opportunity for Compliance (NOC)

- 3. Is the structure and length of a conversational episode similar between mothers who are speaking to their toddlers with ASD and mothers who are speaking to their TD toddlers?*

Our third specific aim addresses whether mothers and their children with ASD have conversational episodes that differ in structure and length from mothers and their TD children. The conversational coding revealed that the mothers' use of conversational structures varied overall depending on the verbal ability of the children. These results are represented in Figure 4. Because the AM children produced more conversational turns and topic initiations, the mothers produced more utterances that responded to the children's turns (i.e., volleys) (AM group: 38% of utterances, LM group: 17%, ASD group: 18%). Mothers of children with ASD produced fewer topic initiations (AM group: 7% of utterances, LM group: 14%, ASD group: 5%) than mothers of LM children and more continuations (AM group: 47% of utterances, LM group: 62%, ASD group: 70%) than mothers of AM children. However, no significant differences were found between

MOTHERS' CONVERSATIONAL PATTERNS

the mothers' of children with ASD and the mothers in the LM and AM groups in their production of topic initiations, volleys, non-contingent turns, and topic interruptions.

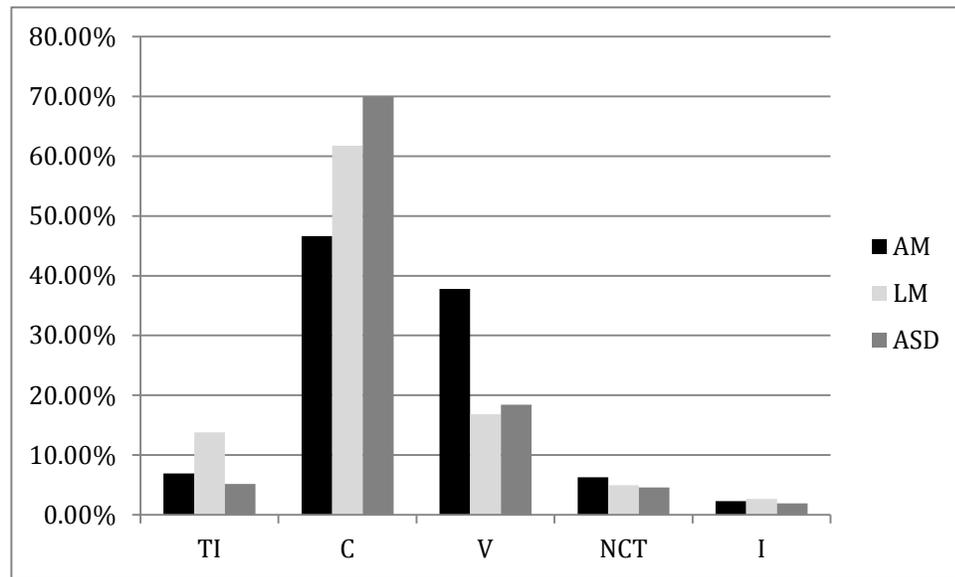
Mothers of children with ASD did produce significantly more continuations than mother of AM children ($t(4)=2.25, p < .041$). The conversational structures of mothers significantly differed according to the diagnosis of the child only for continuations.

Overall, the mothers' conversational structure appears to vary according to the verbal ability of the children, not their diagnosis.

Overall, there were no significant differences in length of episode between mothers of children with ASD and mothers of TD children. Descriptively, the length of conversational episodes might differ according to the diagnosis of the child. The average length of a conversational episode was longer for dyads in the ASD group than for dyads in the AM and LM groups (ASD group: 29 utterances, AM group: 18 utterances, LM group: 15 utterances). This difference is due to the increased number of continuations produced by mothers of children with ASD. Continuations are utterances produced by one speaker that relate the topic and extend the length of the episode.

MOTHERS' CONVERSATIONAL PATTERNS

Figure 4: Maternal Use of Conversational Structures



The percentage of mother utterances that are topic initiations (TI), continuations, (C), volleys (V), non-contingent turns (NCT) and interruptions (I).

Discussion

This study investigated maternal pragmatic and conversational input to children with ASD, particularly the types of utterances and the conversational structure produced. The children's responses to the mothers' questions and commands were also examined. As mentioned earlier, previous research on TD children has shown that differences in maternal utterances and conversational structure alter the nature of interactions in ways that affect children's acquisition of language. Very few studies have investigated the differences in maternal utterances to children with ASD as compared to TD children. The findings of this study show the similarities and differences between the discourse of mothers of children with ASD and mothers of TD children.

MOTHERS' CONVERSATIONAL PATTERNS

First, the proportion of pragmatic structures produced by mothers of children with ASD varied from the proportion of structures produced by mothers of TD children. The mothers used more commands and fewer descriptive (i.e., “yes/no”) questions. As previously discussed, Venuti et al. (2012) also found that mothers of children with ASD use more commands when speaking to their children. The present study extends their work by further examining the types of commands and questions and testing somewhat younger children. For the types of commands in this study, mothers did not differ in the proportion of indirect commands, but they did differ in their proportion of direct commands. Furthermore, indirect commands only made up 4-6% of the mothers’ utterances. Perhaps the indirect commands make up a small proportion of maternal speech no matter the age, language level, or diagnosis of the children. For the types of questions in this study, mothers did not differ in the proportion of information questions, but they did differ in the proportion of descriptive questions. The mothers might ask a lower proportion of information questions when speaking to children in the age range of this study because they do not expect these young children to respond contingently. Since mothers of children with ASD asked fewer descriptive questions and produced more direct commands, they may not expect a “yes/no” response from their children, and instead, produce a command to direct or redirect their children’s behavior.

The use of fewer questions and more commands has been associated in the literature with slower language development in TD children. These results suggest that TD children hear different proportions of the various pragmatic structures than children with ASD. The structures TD children hear most often are positively correlated with language development, while the structures children with ASD hear with relatively

MOTHERS' CONVERSATIONAL PATTERNS

greater frequency are negatively correlated with language development. This correlation does not indicate causality; however, the AM and LM groups were similar in proportions despite varying language ability, while LM and ASD groups differed despite similar language ability. This suggests that the difference is tied to the disorder and not the child's language level. The pragmatics of the AM and LM groups are more similar than either group is to the ASD group.

Additionally, when Siller and Sigman (2002) studied the types of utterances that mothers produced, mothers of children with ASD who used fewer commands had children with more advanced language development years later. They suggested that the utterances that direct or suggest a behavior do not follow the child's direction of attention. Perhaps, some mothers of children with ASD in the present study might have had more difficulty engaging in joint attention with their children, resulting in the use of more utterances that direct attention. Since the mothers of children with ASD in our study used significantly more direct commands than mothers of both age- and language-matched children, they might be engaging in less joint attention, redirecting their children, and they may have children with less advanced language development. However, these mothers may have been adapting to their children's abilities in attempting to engage in joint attention throughout the interaction.

These findings have possible implications for evaluation. Because commands are associated with slower language development, and questions are associated with increased language development, it might be worth examining mothers' use of these structures in clinical settings. Previous research supports that the interaction style of mothers may have an impact on their children's language development. If mothers utilize

MOTHERS' CONVERSATIONAL PATTERNS

more questions and fewer commands, their behavior may facilitate their children's language development. This further supports parent involvement in an approach to autism intervention .

When responding to commands and questions, children of similar language level performed similarly. The LM children and children with ASD answered questions and complied with commands similarly despite hearing different proportions of these utterances in maternal speech. This might mean that the maternal input is not impacted by the children's ability to comply or answer. Mothers also gave their children similar opportunities to comply with commands and to answer questions according to their children's language level. Although it appears that mothers of LM children gave fewer opportunities to respond to information questions than mothers of children with ASD, there were no significant differences. It is possible that with more participants this would be a reliable difference, indicating that the mothers of children with ASD might expect a response from their children more often than mothers of LM children. Since this finding contrasts with the expected outcome and the outcomes in the other categories, this finding may indeed be insignificant. Although the response coding measured both verbal and nonverbal responses to questions and commands, this measure was possibly not sensitive enough to certain components of social responsiveness including eye gaze and joint attention. The videos of mother-child dyads were not originally intended for pragmatic coding, and therefore they do not focus on the faces of the mother and child throughout the taping. With more sensitive measures and a larger sample size, there may have been significant differences found between the LM and ASD groups.

MOTHERS' CONVERSATIONAL PATTERNS

Although the pragmatic structures of mothers varied depending on the diagnosis of their child, the overall conversational structure did not. The mothers' conversational structure varied depending on the verbal behavior of the children. These results are in accordance with previous studies that mothers produce fewer topic initiations as their TD children got older (McDonald & Pien, 1982). When comparing mothers of LM children and AM children, mothers of LM children produce many topic initiations and fewer utterances that maintain a topic. These results were also in accordance with other previously cited literature: Van Balkom et al. (2010) found that mothers of children with DLD use fewer verbal topic initiations over time when compared to mothers of age-matched peers. In this study, mothers of children with ASD appear to produce fewer topic initiations. Taken together, the two studies may indicate that mothers produce fewer topic initiations when speaking to children with a language delay or disorder.

Although the difference was not statistically significant in our study, mothers of children with ASD produced longer conversational episodes than mothers of LM and AM children. This means that mothers are staying on a particular topic and producing more utterances that continue that topic. Mothers of children with ASD may spend more time on an activity or topic, trying to engage their child in that topic. Since the children in this study were already receiving early intervention services, the mothers may have learned therapeutic techniques and activities that are engaging for their children. The mothers' style of interaction may be impacted by these techniques. For example, each of the mothers provides activities that are language rich and interactive for the children. These types of activities lend themselves to a longer conversational episode.

MOTHERS' CONVERSATIONAL PATTERNS

This study was exploratory in nature and therefore had a small sample size. Given the small sample, it is not surprising that only a few tests showed significance. In fact, it is striking that despite the small sample, some findings were so robust that they were statistically significant. The major significant finding of this study was that the mothers' use of direct commands varied according to the diagnosis of the child, not the language level or age. Mothers may adapt their pragmatic style according to their child's diagnosis to encourage them to attend and engage in joint attention. Since the mothers in the ASD group were similar to the mothers in the LM group in their production of conversational utterances, mothers may adapt their conversational structure according to the language level of their child. The diagnosis of the child did not appear to affect the mothers,

Limitations. This was an exploratory study, looking into the pragmatic and conversational characteristics of the mothers' speech to their children. Although we had some significant findings that warrant further exploration, the biggest limitation of this study was the small sample size. Furthermore, the LM group contained one less dyad than the AM and ASD groups. It is possible that more significant findings would occur between groups with a larger sample size. The results cannot be generalized to a larger population because the experimental group may not be representative of the greater population of children with ASD. The findings of this study must be replicated with a larger number of participants in order to generalize the results and fully explore the implications.

Furthermore, the results may vary with maternal characteristics: ethnic and language background, SES, education, parenting views, and emotional status. All of the mothers in our study were Caucasian and middle class. Tamis-LeMonda, Song, Leavell,

MOTHERS' CONVERSATIONAL PATTERNS

Kahana-Kalman, and Yoshikawa (2012) found that mothers from Mexican, Dominican, and African-American backgrounds differed in their production of commands and gestures and their children showed differential outcomes at age 2. To fully explore and generalize the difference between maternal input to TD children and children with ASD, a sample representative of the larger population would be required.

Results may also vary according to the language context in which the sample is taken including free play, mealtime, and book reading. For example, Bornstein, Tamis-LeMonda, and Haynes (1999) found that mothers used more vocabulary during play than mealtime. Mothers may adapt their language and conversational style and structure according to the activity being performed. Furthermore, children may be exposed to varying amounts of different activities throughout the day, with some activities being more language rich than others. In order to fully capture the mothers' conversational style and structure, various activities and language contexts should be compared. Current work in our lab is examining the book-reading sessions. This may be an interesting comparison, because the book used was a wordless book with detailed pictures. Since book reading constrains what is labeled and might help to focus the mothers and children on the same things, perhaps some of the pragmatic differences we observed will be less apparent in that context.

Future research is warranted because of the significant findings that were made with this small sample size. Research should analyze the pragmatic utterances and conversational structure of mothers of children with ASD compared to mothers of TD children. Further, it would be informative to add additional controls. In particular, studying input to children with DS and children with DLD will help us tease apart the

MOTHERS' CONVERSATIONAL PATTERNS

extent to which differences in input are do to language disorders *per se* or due to the social deficits that accompany ASD. There should also be a sensitive measure of children's social responsiveness including elements of gaze direction and joint attention, and the children's future language development. When these findings are replicated in a large-scale study, results can be generalized to the greater population and the implications for intervention will be greater.

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