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ALTERING THE PROSODIC FEATURES OF
MOTHERESE TO PROMOTE JOINT ATTENTION
IN LANGUAGE-DELAYED CHILDREN

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Structured Abstract

Clinical Question: For children ages birth to 3 years diagnosed with a language delay or disorder, to what extent does the prosodic component of motherese aid in establishing joint attention (JA)?

Method: Systematic Review

Study Sources: ASHA, Web of Science, CINAHL, MEDLINE, EBSCO, PubMed, PsycINFO, and ERIC

Search Terms: motherese, infant directed speech (IDS), child directed speech (CDS) AND parent child interaction OR joint attention OR engagement

Number of Included Studies: 4

Primary Results: Infants benefit from the use of motherese, including altered prosody and lexical content, to promote language development and engagement in JA.

Conclusions: Motherese is a register used by mothers to gain attention with their children. JA is a pivotal skill used by infants to aid in communication. There is limited evidence that suggests a relation between the prosody used in motherese and infants' subsequent JA engagement. Further research is needed that specifically examines the prosodic aspects of motherese that are beneficial to language development.

Altering the Prosodic Features of Motherese to Promote Joint Attention in Language-Delayed Children

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Clinical Scenario

Janice is a speech-language pathologist who provides early intervention services for children ages birth to 3 years in rural communities. She recently received a referral for Sara, a 26-month-old girl who was not talking. Upon completing the evaluation, Janice determined that Sara had a moderate-severe receptive-expressive language delay and qualified for early intervention services. Sara spoke approximately 10 words (e.g., drink, mine, no, mama, dada, cookie) and demonstrated some atypical social behaviors (e.g., she did not look when Mom called her name, she did not participate in joint attention when Mom played with her). Sara was an only child, and Mom stayed at home with her during the day. Mom reported few opportunities for Sara to socialize with her peers throughout the day. Janice decided to provide direct intervention services to Sara, at the same time modeling and training Mom in effective parent-child interaction strategies, two times per month for an hour. The service delivery model used by her local early intervention program focuses on parent training to optimize parent-child interactions and carryover in the home.

Janice provided in-home therapy for Sara and her mom for two months; however, Mom expressed minimal improvements in Sara's speech. Mom reported that Sara "doesn't seem to be interested in anything I say because she will not even look at me when I talk to her." For the next visit, Janice decided to observe Mom and Sara's interactions to see if she could identify any specific areas of concern. During the observation, Janice noted that Mom used simple short phrases but her vocal intonation was flat.

Janice feels confident in her knowledge of joint attention and the benefits it has on a child's language development. Janice wonders if training Mom in age-appropriate communication strategies for her 26-month-old, especially training in the prosody of motherese, would facilitate joint attention between her and Sara, thus increasing Sara's use of language.

Background Information

In the literature, motherese is also called infant-directed speech (IDS) or child-directed speech (CDS). For the purposes of this evidence-based decision, motherese will be the term used. Motherese can simply be described as "baby talk." According to Fernald (1985), motherese is characterized by simplified lexicon, shorter utterance length, higher pitch range, and wider pitch range. The altered acoustic properties of motherese are thought to highlight salient information in the mother's speech and to cue the child in to turn-taking (Fernald, 1985). Fernald and Kuhl (1987) examined the isolated acoustic properties of motherese (i.e., pitch, loudness, and duration) to determine which property was most significant in gaining an infant's attention. Twenty 4-month-old babies listened to three prerecorded samples of motherese; each sample highlighted either pitch, loudness, or speech duration. They found that infants had a significant preference for the wider pitch range and pitch changes associated with motherese.

When examining the lexical components of motherese, many researchers have found a positive correlation between use of motherese and early word recognition (Singh, Nestor, Parikh, & Yull, 2009), child's mean length of utterance (Venuti, de Falco, Esposito, Zaninelli, & Bornstein, 2012), receptive language (Perryman et al., 2013), and overall language development (Majorano, Rainieri, & Corsano, 2013). When these individual language components are used by communication partners, they also aid in establishing joint attention.

Joint attention (JA) is the ability to coordinate attention between another communication partner and an object (Dominey & Dodane, 2004). The elements of JA include eye gaze toward a stimulus or communication partner and gaze shifting between a communication partner and stimulus. Responding joint attention (RJA) occurs when a person responds to the attention bids of a communication partner. These communication bids can be linguistic, where the partner uses language to draw the child's attention, or

gestural, where the partner points at an object of interest. Initiating joint attention (IJA) occurs when a person initiates JA bids with another communication partner (Mundy & Newell, 2007).

It is theorized that engagement in JA promotes language acquisition because the infant attends to an object while hearing and learning language about that object (Dominey & Dodane, 2004). Tomasello and Farrar (1986) examined mother-child dyads in search of a relation between the lexical aspects of motherese and establishment of JA in the dyad. Their results indicated that during episodes of JA in the dyad, the mother's vocabulary was focused on the object of attention by the child, and the child used more language. Research has also found that the topic of mother-infant conversation supports JA engagement (Mendive, Bornstein, & Sebastián, 2013). When parents are taught to use age-appropriate language, children are more likely to engage in JA episodes, which further promote language learning.

The evidence suggests relations between the lexical aspects of motherese, language development, and JA; however, the relations between the prosodic components and language and JA are less clear. Given the important role of motherese and JA in language development, it is theoretically possible that teaching the prosodic aspects of motherese would aid in facilitating JA. Therefore, the purpose of this evidence-based review will be to determine if the prosodic aspects of motherese increase childrens' engagement in JA.

Clinical Question

Janice developed a PICO (i.e., population, intervention, comparison, and outcome) question, as recommended by the American Speech-Language-Hearing Association (ASHA), to investigate her query (Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000).

P: Children ages birth to 3 years diagnosed with a language delay or disorder

I: Using the prosodic components of motherese

C: Using adult-directed speech

O: Improved JA

PICO question: For children ages birth to 3 years diagnosed with a language delay or disorder, to what extent do the prosodic components of motherese aid in establishing joint attention (JA)?

Search for the Evidence

Janice used the following inclusion criteria: studies that included children ages birth to 3 years (or with a developmental age equivalent to 3 years old) and children with or without a developmental delay or disorder. The studies used a comprehensive definition of motherese that included the acoustic properties of higher pitch, altered loudness, and shorter utterance length (Fernald & Kuhl, 1987), and the studies addressed direct or indirect aspects of JA (Dominey & Dodane, 2004). The studies could be experimental or observational in nature. They must have been published in a peer-reviewed journal and reported in English.

Janice used the following exclusion criteria: studies that included children over the age of 3 years, and studies that addressed only the semantic and syntactic components of motherese. Studies were also excluded if they posited new theories of development or were not written in English.

In order to access full text journal articles, Janice acquired temporary access to her local university library's online databases. Janice conducted a comprehensive search of the following databases: ASHA publications, Web of Science, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), MEDLINE, Elton B. Stephens Company (EBSCO), PubMed, PsycINFO, and Educational Resources Information Clearinghouse (ERIC). She used a combination of the following search terms in the above databases: motherese, infant directed speech (IDS), child directed speech (CDS) AND parent child interaction OR joint attention OR engagement.

Evaluating the Evidence

Janice's initial search returned 3,491 articles (see Figure 1). After removing duplicates, reviewing the titles, and skimming the abstracts for appropriateness, she found 30 articles that addressed either motherese, IDS, CDS, or joint attention in the abstract. After reviewing the references in these 30 articles, she found another four articles of possible relevance. After reading the articles, she found four articles that contained information regarding the prosodic and lexical aspects of motherese and joint attention. She used these four articles to make her evidence-based decision (see Table 1).

Janice used the Critical Appraisal of Treatment Evidence (CATE) rating scale from Dollaghan (2007) to evaluate the validity and importance of the articles she selected (see Table 2). For validity, a rating of compelling indicated that

the research was undebatable and other experts in the field would reach similar conclusions. A rating of compelling equals 7 to 10 yes answers to questions 1 through 10 on the CATE. A rating of suggestive indicated that researchers would agree with most of the conclusions, but some of the points might be debatable. A rating of suggestive equals 4 to 7 yes answers on questions 1 through 10 on the CATE. A rating of equivocal indicated that there would be significant debate among researchers, such that they might reach varied conclusions. A rating of equivocal equals 1 to 4 yes answers on questions 1 through 10 on the CATE.

For importance, the ratings of compelling, suggestive, and equivocal are parallel to their definitions in the previous paragraph. A rating of compelling equals 4 or 5 yes answers to questions 11 through 15 on the CATE. A rating of suggestive equals 3 yes answers on questions 11 through 15 on the CATE. A rating of equivocal equals 1 or 2 yes answers on questions 11 through 15 on the CATE.

If a study is rated as compelling for both validity and importance, then clinicians should consider incorporating the findings into their clinical approach. If a study is rated as equivocal for both validity and importance, then clinicians should not consider incorporating the findings into their clinical approach. When the ratings for validity and importance are suggestive or mixed (e.g., validity equal to suggestive and importance equal to equivocal), then different clinicians would come to different conclusions to alter their clinical practice. As such, clinicians might choose to proceed with caution in changing their clinical practices.

The following is a discussion of the subjects, methods, results, and CATE ratings from the four included studies. See Tables 1 and 2 for details.

Santarcangelo and Dyer (1988)

Santarcangelo and Dyer (1988) examined the effects of prosody in developmentally delayed children. This research included two studies. Six children, ages 8 to 16 years, participated in their first study. Three of the children had a developmental age of less than 3 years old, and three of the children had a developmental age of greater than 5 years old. The researchers gathered information by observing teachers interacting with all six students for 10 minutes. The teachers' utterances were coded for use of motherese versus use of adult-directed speech (ADS). Teachers were then instructed to use motherese with a higher pitch, rising inflection, and acoustic highlighting. They measured the children's gaze shift and direction following in response to

the two different teacher registers. Gaze shift was defined as the child orienting or shifting his/her gaze toward the teacher's face for more than 3 seconds. The results indicated that the children who functioned below a 3-year-old level had more frequent gaze shifts and direction following in response to the teachers' use of motherese. The older functioning children seemed to respond equally to motherese and ADS. Santarcangelo and Dyer (1988) only performed descriptive statistics in this study. The results indicated that the younger functioning children responded appropriately 80 to 100% of the time when the teachers used motherese.

The second study by Santarcangelo and Dyer (1988) had four participants that were functioning at a 3-month-old level according to the Early Learning Accomplishment Profile (E-LAP™; Hardin & Peisner-Feinberg, 2001). In this study, the teachers conducted one-on-one sessions with the children for 5 to 10 minutes over five sessions. The teachers spoke to the children randomly alternating between motherese and ADS (similar to the first study). Santarcangelo and Dyer measured the infants' use of eye gaze and direction following. Eye gaze was defined in the same manner as gaze shift in the first experiment. The results indicated that all the children had more attentive eye gaze and direction following when the teacher used motherese.

These studies by Santarcangelo and Dyer (1988) provide initial evidence that low functioning children with developmental delays can use eye gaze and follow directions better when the communication partner uses motherese. Both of these skills were facilitated through the use of motherese in these studies.

While the Santarcangelo and Dyer (1988) studies did not have control conditions, did not use randomization in the selection of participants, and had a limited number of participants, Janice determined the measures used were both valid and reliable for the constructs examined. Furthermore, Janice rated the study high in external evidence because there were few controls used. She rated the article as compelling to suggestive for overall validity of the study design. She rated the overall importance of the research as suggestive because the authors did not perform additional statistical analyses to determine the significance of the findings.

Schachner and Hannon (2011)

Schachner and Hannon (2011) researched the visual preference of infants when presented with videos of women speaking motherese versus ADS. Twenty 5-month-old

infants viewed four videos (i.e., two of women speaking motherese and two of women speaking ADS). The motherese used in the videos was characterized as higher pitched speech and increased pitch changes during speech. After the videos, the infants were shown two pairs of women (i.e., one from the motherese or ADS video and a stranger). After the motherese videos, the infants regarded the picture of the woman who had spoken motherese significantly longer than the stranger. After the ADS videos, the infants regarded the stranger significantly longer than the woman from the ADS videos. The results were different when the videos were presented to infants without the sound information. Without sound information, the infants demonstrated no significant preference for the speaker of motherese or the speaker of ADS. This research found that the use of motherese may influence the visual preferences of a child for the people in his or her environment.

The Schachner and Hannon study (2011) did not have a control group or randomization in selecting participants. Janice determined that the measures used to test infant preferences were valid; however, she did not consider the measures to be reliable because the infants' preferences were only measured four times in each scenario. She judged the article to be higher internal validity because the researchers controlled for many extraneous variables. Janice rated the overall validity of the study as compelling to suggestive. Because judging infant's gaze preferences after a video recording is inferior to actual measures of interactions, she rated the overall importance as suggestive.

Roberts et al. (2013)

Roberts and colleagues (2013) studied 264 families and infants to predict a relation between maternal speaking style when the infants were 6 months old and subsequent JA skills when the infants were 12 months old. They observed mother–infant interactions at 6 months and coded them for use of motherese with their infants and the pitch changes used by the mothers during conversations. At 12 months, the same families were observed in JA interactions with their infants. The results indicated the musicality (or pitch changes) in mothers' voices during interactions at 6 months were predictive of the infants' JA skills at 12 months. This study further suggests that the prosodic qualities of motherese promote infants' abilities to establish JA with communication partners.

When rating the Roberts et al. (2013) study, Janice noted that this was an observational study of mother–infant dyads.

Caregivers completed a norm-referenced survey as another measure of the study, which improved the internal validity of the study. However, there was no mention of blinding when evaluating the mother–infant interactions. For this reason, Janice rated the overall validity as suggestive to equivocal. In contrast, she rated the overall importance as compelling to suggestive because Roberts et al. (2013) interpreted their findings from a large sample of the population.

Droucker, Curtin, & Vouloumanos, 2013

The last study considered in Janice's evidence-based decision (Droucker, Curtin, & Vouloumanos, 2013) compared the facial preferences of two different groups of infants (i.e., 36 infants with a typically developing older sibling [SIBS-TD] and 14 infants with an older sibling diagnosed with autism spectrum disorders [SIBS-A]). At 6 months old and again at 8 months old, both groups of infants were shown videos of women speaking motherese and ADS. The samples of motherese used in this study were significantly higher pitched than the ADS samples. The researchers then showed a black and white image of a female face or a black and white checkerboard to the infants and measured the infants' visual preferences for the face or checkerboard after the video.

Then, at 12 and 18 months old, the parents completed the MacArthur-Bates Communicative Development Inventories (CDI; Fenson et al., 2006) and the Mullen Scales of Early Learning (MSEL; Mullen, 1995) to gather information about the child's language and social development. The children were shown the same videos. Both child groups watched the motherese video significantly longer than the ADS video, and both groups looked at the picture of the woman's face significantly longer than the checkerboard. The CDI scores at 18 months for SIBS-TD were predicted by their preference for motherese at 12 months. In contrast, the CDI scores at 18 months for the SIBS-A were predicted by their preference for looking at a real face rather than the checkerboard image at 12 months. Looking at faces could be considered a concomitant skill with JA. The child must look at the partner's face and at an object of interest in order to establish JA. Furthermore, as children learn to associate meaning with words, faces become more important (Droucker et al., 2013). This study suggests that the use of motherese primes the infant to look for the source of speech (i.e., the face that is talking).

In order to critically appraise the Droucker et al. (2013) article, Janice determined that there was a control

group and the treatment was described in sufficient detail. Janice rated the procedures as valid in design and reliable in measures used. The study had high internal validity because the researchers had multiple controls. Both groups watched the motherese video significantly longer than the ADS video. For these reasons, Janice rated the overall validity as compelling to suggestive. Janice rated the overall importance as suggestive because the researchers measured the infants' gaze preferences after hearing the recording of motherese rather than while hearing the recording of motherese.

The Evidence-Based Decision

Janice initiated this review to determine if modeling speech using a motherese register, focusing on the prosodic cues used, would be beneficial to establish JA with Sara. Janice believes that JA is a prerequisite for language learning because a child must attend to the communication partner before being expected to imitate. Furthermore, she considers motherese to be a developmentally appropriate technique to gain a child's attention. With this particular child, the mom changed the lexical content of her speech but did not change her prosodic cues to highlight important information for her child.

Janice found considerable evidence to show the benefits of motherese; however, the research primarily focused on the lexical aspects of motherese. The mother Janice was training used age-appropriate language, but her intonation was flat. Using the four studies Janice found measuring the prosodic aspects of motherese and elements of JA, she concluded that the majority of the infants benefited from motherese to aid in establishing components of JA. Santarcangelo and Dyer (1988) provided the most compelling answer to Janice's question. This study found that developmentally delayed individuals engaged in increased eye gaze and direction following when the communication partner used motherese. This study focused on teachers using prosody, rather than lexical, components in their motherese, but it had a significant weakness because there were limited participants. The other articles examined eye gaze in response to motherese and, in general, found that infants increase their eye gaze in response to motherese (Droucker et al., 2013; Roberts et al., 2013; Schachner & Hannon, 2011).

In considering the evidence, Janice decided to proceed with caution in training Mom to use the prosodic aspects of motherese in her speech since the evidence is limited that relates prosody in motherese to establishing JA. Janice considered her limited frequency of intervention and

decided that she would spend approximately 15 to 20 minutes educating Mom in the benefits of motherese. The remaining 40 to 45 minutes of the session would be spent modeling and coaching Mom in her use of motherese. She instructed Mom to take 15 minutes each day where she focused on using increased prosody while interacting with Sara. Janice decided to follow this protocol for two sessions. She would evaluate the progress Sara made in JA in interactions and her attempts at imitation of new words at the end of another 2-month trial period.

Conclusion

For many mothers, the use of prosody and simplified language that is characteristic of motherese comes naturally. Copious research has found that motherese benefits children's language learning (Majorano et al., 2013; Singh et al., 2009; Venuti et al., 2012). However, there is limited research implicating the use of motherese as a means of establishing JA. Engagement in JA is thought to promote language acquisition because the infant attends to an object while hearing age-appropriate language regarding the object (Dominey & Dodane, 2004). Further research is needed to provide a direct correlation between the use of motherese and its ability to establish JA.

Author Note

Traci Fredman is an academic and clinical instructor at West Texas A&M University in the Department of Communication Disorders. She is currently pursuing a PhD in speech and hearing sciences at Texas Tech University Health Sciences Center. Her current research focus is parent-implemented early intervention for children diagnosed with autism spectrum disorders. She has 11 years of experience treating children through early childhood intervention and adults in long-term care.

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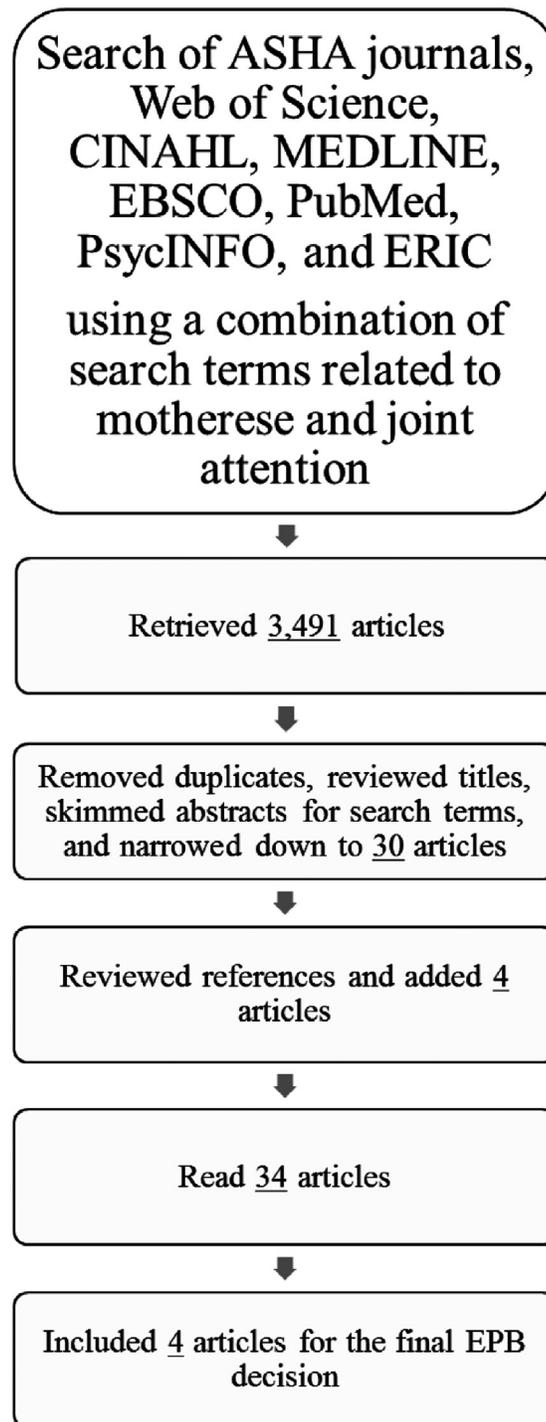


Figure 1. Search for the evidence.

Table 1. Articles Used to Make the Evidence-Based Decision

Citation	Participants	Research Aim(s)	Procedures	Results	Relevance to PICO Question
Santarcangelo & Dyer (1988)	Study 1 N = 6 children Ages = 8–16 years old 2 groups divided into functioning below and above 3-year-old level	Does use of the vocal prosody typical of motherese improve the responsiveness of children with severe developmental delays?	Study 1 Performed 10-minute observations of teaching interactions with the students Measured gaze shift toward the teacher Measured correct responses to teacher directives	Study 1 Children functioning below 3 years had higher responses to motherese versus conversational tone. Children functioning above 3 years did NOT show preference for motherese.	The children who were functioning below a 3-year-old level had increased eye gaze, which is a component of joint attention, when the teacher used motherese.
	Study 2 N = 4 Ages = 7–9 years old Functioning at 3-month-old level		Study 2 1:1 sessions for 10 minutes where teacher spoke at random alternating conversational and motherese tones Measured eye gaze and direction-following abilities for different registers	Study 2 Order of presentation of different registers did not make a difference. The children used eye gaze and followed directives better when the teacher used a motherese register.	
Schachner & Hannon (2010)	Study 1 N = 20 infants Age = average of 5 months 10 boys & 10 girls	What are the effects of an adult’s infant-directed speech (IDS) versus adult-directed speech (ADS) on 5-month-old infants? Do infants’ preferences for IDS versus ADS change when auditory information is removed?	Study 1 Recorded four 60-second videos of 2 different speakers, each using IDS and ADS Infants watched the videos Infants were shown a pair of women (one from video and one new) Measured which image infant preferred	Study 1 Infants watched the IDS and ADS videos for the same amount of time. For the IDS video, infants looked at the woman who spoke IDS significantly longer. For the ADS video, infants looked at the stranger significantly longer.	Five-month-old infants looked at the women who spoke motherese longer than the women who spoke with ADS. Looking at objects of interest is a skill involved in joint attention.
	Study 2 Same population		Study 2 Same recordings presented without sounds Same procedures as Study 1, but did not use sounds	Study 2 Infants had NO significant preferences for the person who spoke IDS or ADS when sound was removed. For the ADS video, infants had significant preference for the ADS person compared to the stranger.	

Table 1. Articles Used to Make the Evidence-Based Decision (continued)

Citation	Participants	Research Aim(s)	Procedures	Results	Relevance to PICO Question
Roberts et al. (2013)	<p><i>N</i> = 264 families with infants</p> <p>Observed parent-child interactions with children at 6 months and 12 months of age</p>	<p>Does parents' infant-directed speech during interactions centered around an object facilitate development of infants' joint attention skills?</p>	<p>Measured the context of the parents' speech at 6 months and assessed for correlation to joint attention skills at 12 months</p> <p>Measured the pitch of mother's speech at 6-month visit and assessed for correlation to joint attention at 12 months</p>	<p>Maternal talk of mental states of infant at 6 months was predictive of joint attention skills at 12 months</p> <p>Mother's pitch of speech at 6-month visit was predictive of joint attention skills at 12 months</p>	<p>Constructs used to define joint attention were gaze following, gaze alternation, and pointing</p> <p>When a mother spoke to her child with a higher pitch characteristic of motherese at 6 months, the child had better joint attention skills at 12 months.</p>
Droucker, Curtin, & Vouloumanos (2013)	<p><i>N</i> = 50</p> <p>36 typically developing infants with at least one older typically developing sibling (SIBS-TD)</p> <p>14 typically developing infants with one older sibling diagnosed with autism spectrum disorders (ASD; SIBS-A)</p>	<p>Do early speech and face preferences differ in infants at risk for ASD?</p> <p>To what extent do early differences in preferences predict language delays and risk-group (ASD) membership?</p>	<p>At 6 and 8 months, infants saw 40-second samples of IDS and ADS, each paired with an image of a female face or a black and white checkerboard.</p> <p>At 12 and 18 months, parents completed a developmental inventory, and the infants viewed the same video samples again.</p>	<p>At 6 and 8 months, infants looked significantly longer at IDS than at ADS.</p> <p>At 6 and 8 months, infants looked significantly longer at the female face than at the checkerboard.</p> <p>At 18 months, the SIBS-TD group scored significantly higher than SIBS-A on measures of communication.</p> <p>At 18 months, the less time the child looked at the checkerboard was significantly correlated with a higher language outcome.</p>	<p>When hearing motherese, at-risk infants had different eye gaze abilities than a group of typically developing infants. Eye gaze is an early skill associated with joint attention.</p>

Table 2. Appraisal of Study Quality from Dollaghan (2007)

Criteria	Studies			
	Santarcangelo & Dyer (1988)	Schachner & Hannon (2010)	Roberts et al. (2013)	Droucker, Curtin, & Vouloumanos (2013)
1. Rationale for the study?	Yes	Yes	Yes	Yes
2. Evidence from an experimental study?	Yes (Study 2)	Yes	No	Yes
3. Control group or condition?	No	No	No	Yes
4. Randomization used to complete groups?	No	No	No	No
5. Methods and participants specified prospectively?	Yes	Yes	Yes	Yes
6. Recognizable participants from beginning to end?	Yes (both)	Yes	Yes	Yes
7. Was the treatment described clearly?	Yes (both)	Yes	N/A	Yes
8. Measures valid?	Yes (both)	Yes	Yes	Yes
Measures reliable?	Yes (both)	No	Yes	Yes
9. Outcome evaluated with blinding?	Yes (both)	Yes	Unknown	Yes
10. Could nuisance variables influence findings?	Yes (both)	Yes	Yes	Yes
11. Was the finding statistically significant?	Did not calculate	Yes	Yes	Yes
12. If 11 was no, was power adequate?	No	No	Yes	Yes
13. Practical significance/ Effect size?	Did not calculate ES	Did not calculate ES	Did not calculate ES	Did not calculate
14. Precise/ Confidence intervals?	No	Yes	Unknown	Unknown
15. Cost-benefit advantage?	N/A	Yes	Yes	Yes
Overall Validity (Questions 1–10)	Compelling to Suggestive	Compelling to Suggestive	Suggestive to Equivocal	Compelling to Suggestive
Overall Importance (Questions 11–15)	Suggestive	Suggestive	Compelling to Suggestive	Suggestive