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Relationship Between Joint Attention and Language  
in Multiparous and Uniparous Households

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## Abstract

The present study was designed to examine differences in the effect of the number of children in the household (also known as “parity”) on the relationship between initiating joint attention (IJA) and language development. We reasoned that infants who are only children (i.e., in uniparous homes), relative to infants who have one or more siblings (i.e., in multiparous homes), would have more opportunity to engage in IJA, and would, therefore, acquire a larger number of object labels. We tested the hypotheses that: 1) there would be a positive correlation between the number of IJA bids and language overall, and 2) parity would moderate the IJA-language relationship such that in uniparous households, the aforementioned correlation would be stronger than in multiparous homes. Joint attention was measured using the Early Social Communication Scales (ESCS) Picture Book Task, and language was assessed through parental report on the *MacArthur-Bates Communicative Development Inventory* (MBCDI). There was no significant correlation between IJA and language on the whole, though there was a significant correlation for infants in uniparous homes between IJA and language. This finding partially supports Hypothesis 2 in terms of the IJA-language relationship being stronger in uniparous homes rather than multiparous ones, though it was only true for productive vocabulary. These null findings may provide reassurance for families with multiple children that their younger children are not at an IJA/language acquisition disadvantage.

*Keywords:* initiating joint attention, language, parity, siblings, infancy

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In an infant's first two years of life, there are countless developmental processes occurring simultaneously that will influence future cognitive and social ability. Through verbal and nonverbal dyadic engagement with caregivers, infants acquire two critical capacities for social engagement: joint attention and language. Joint attention emerges around the time an infant is six months old and develops well into childhood through continued social interaction (Mundy et al., 2007). This nonverbal means of communication is understood as the infant's ability to engage with a social partner in combined attention to objects or events within the environment (Salley & Dixon, 2007). Joint attention comes in two forms: responding to joint attention (RJA) and initiating joint attention (IJA). RJA, which first emerges between 3 and 6 months of age (D'Entremont, Hains, & Muir, 1997; Scaife & Bruner, 1975; Vaughan Van Hecke et. al, 2007), involves an infant (usually visually) following an initiator's nonverbal behaviors of pointing, moving of the head, or changing eye movement, so that the child's gaze lands on the target of the initiator's gaze (Scaife & Bruner, 1975). IJA begins developing around 9-18 months of age (Mundy et al., 2007) and is characterized by a child's effort at eliciting (usually visual) attention from a social partner for an object or event of interest to the child, through use of "eye contact, pointing, and showing" (Mundy, Hogan, & Doehring, 1996).

IJA can be further divided into high and low levels of activity to distinguish levels of sophistication in their related actions, with lower levels emerging earlier (Mundy et al., 1996, Salley & Dixon, 2007). Low-Level IJA bids elicit the visual attention of a social partner through eye contact and alternating/referencing looks between an object and the social partner. High-

Level IJA bids are efforts to initiate joint attention toward a target object through the additional behavioral elements of pointing or showing (Mundy et al., 1996).

In this investigation, we focused on the role of IJA. There are conflicting results when examining the relationship between IJA and language development, with some studies indicating no significant links between IJA and language (Salley & Dixon, 2007) and others indicating multiple links (Mundy et al., 2007; Tomasello & Farrar, 1986). These inconsistencies could be influenced by the infant's age at the time of testing, as joint attentional skills are acquired gradually over developmental time. For example, Salley and Dixon (2007) found no relationship between total vocabulary and IJA at 21 months of age. In contrast, Mundy et al. (2007) reported associations between measures of IJA at 9, 15, and 18 months with 24-month receptive language. When considering the type of IJA, both high-level (pointing and showing) and low-level (eye contact) IJA predicted receptive language measures at 24 months old (Mundy et al., 2007). Mundy concluded that there are periods of IJA development that correlate with social engagement – early use of IJA is a function of motivation for social interaction and language acquisition within these interactions. It is possible that by 21 months of age, as in Dixon and Salley (2007), the IJA-language relationship ceases to emerge.

The finding that IJA is associated with later receptive language, however, does not explain the origin of the relation. Tomasello and Farrar (1986) suggest that the reason for the association is that mothers use infants' IJA cues tactically when labeling new objects. They found that especially during bouts of word-learning, mothers adjusted their behaviors to their children's attentional focus. The attentional change resulted in a positive correlation of object references with either the children's overall vocabulary measures, the number of nominal words, or both. In their study, 16 of 24 children acquired a greater number of object labels after

initiating joint attention with their mothers than when outside of a joint attentional context (Tomasello & Farrar, 1986).

Clearly, there is reason to believe that joint attention plays an important role in language acquisition – more opportunities for engaging in joint attention should be linked to more precocious language acquisition. An important next step, then, would be to evaluate factors that influence children’s opportunities for initiating joint attention. One such factor may be the number of siblings living in the home (i.e., “parity”), because siblings may compete for parental attention. Younger infants in multiparous homes may have less opportunity to initiate joint attention than first-born or only-infants in uniparous homes. For the purposes of this study, we understand uniparous as meaning only children and multiparous as meaning having one or more siblings at the time of the study.

Unfortunately, there seems to be a gap in the research on links between parity and either joint attention or language development. In one study that briefly mentioned the number of siblings, Mundy et al. (2007) found no association between parity and either IJA or vocabulary size. Despite the paucity of literature on parity in infancy, there are well-documented studies on birth order. Studies from the birth order literature may provide some guidance regarding hypotheses concerning parity. Studies referencing “second-born” or “later-born” children are certainly referencing multiparous homes; whereas, at least with infant populations, studies referencing “first-born” children are often, but not exclusively, referencing only-children.

The infancy literature on birth order, overall, confirms the expectation that first-borns hear more infant-directed language than later-borns (Oshima-Takane et al., 1996), and it may be that infant-directed language, per se, is the most important form of language exposure for children’s linguistic proficiency. In contrast, total language exposure in the household appears to

be inversely related to language proficiency. Nelson (1973) reported a significant negative relationship between the amount of time a child spent with other children, including siblings, and children's language proficiency in the second year. Indeed, crowded home environments appear to delay behavioral and cognitive development in children, in general, and contribute to differential responsiveness and/or neglectful behaviors on the part of parents (Evans, Maxwell, & Hart, 1999; Matheny et al., 1995). Evans et al. (1999) studied 42 families of varying household densities (i.e., from one to five children) from the time the youngest child was 6 months old until 3 years of age and found a negative correlation between household crowding and child linguistic competence. More specifically, they found that a household density of greater than 0.71 persons in the room was related to a decrease in parental responsiveness and children's speech diversity (Evans et al., 1999). The deficiency of attention toward children in crowded environments can significantly hinder joint attentional engagement, and consequently, language acquisition. Thus, even though later-born children in multiparous homes may be exposed to higher quantities of overall language in the home, this exposure does not automatically translate to a linguistic advantage. Quality of language exposure, especially that which occurs in joint-attentional contexts, may be the more important factor.

Not only does an environment with multiple children affect the number of opportunities for joint attentional episodes in the service of acquiring language, but the heightened levels of ambient activity in multiparous homes may even serve to distract children attempting to acquire vocabulary. There are a few studies of novel word learning in distracted environments that support this contention. Dixon and Salley (2007) found that although environmental distractions had no effect on the comprehension of novel nouns acquired in the lab, those distractions did hinder 22-month-olds from generalizing labels. The researchers suggested there was a "sleeper

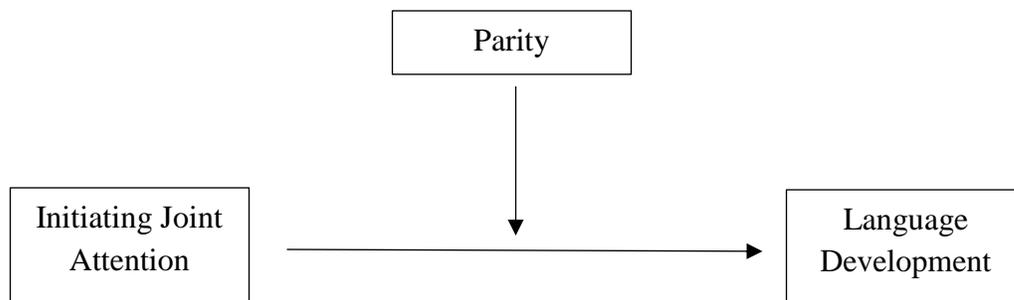
effect,” such that if distractions are present while a child is learning the words, there will be a decline in the ability to consolidate the label into long-term memory. A similar kind of distraction may take place in the higher density environments typical of multiparous homes, providing infants with a greater challenge to engage in IJA. Over time, the combination of less opportunity for IJA and potential lack of consolidation of novel labels due to environmental distractions may disadvantage children in multiparous homes for language acquisition.

It stands to reason that first-borns, at least while they are only children, have greater opportunities for joint attention since the parent’s sole attention is on them. Those in uniparous homes would not have to vie for parental attention as would later-born infants in multiparous homes. In sum, we posited that children in uniparous homes would have greater opportunity to employ joint attention with the parent as a tool to acquire object labels and would have stronger overall vocabulary scores. Alternately, we reasoned that children in multiparous homes would be at a disadvantage for using IJA in the service of word-learning since the frequency of isolated parent-child word-learning events would be compromised by distractions caused by the mere presence of siblings. The difference in the opportunity of IJA use may influence the strength of the IJA-language correlation depending on parity.

In sum, the present study was designed to examine the effect of parity on the relationship between initiating joint attention and language acquisition in infants. Research suggests that distracted environments impede children’s ability to acquire language (Dixon, Salley, & Clements, 2006; Dixon & Salley, 2007; Evans et. al, 1999; Matheny et al., 1995). We proposed that later-born children in multiparous homes would not only be hindered in language development due to the presence of environmental distractions (in the form of older siblings) but

that these living conditions would also interfere with opportunities to engage in bouts of joint attention with the caregiver.

We tested two hypotheses: 1) that there would be a positive correlation between the number of IJA bids and language overall, but 2) that parity would moderate the IJA-language relationship, such that in uniparous households, the aforementioned correlation would be stronger than in multiparous homes. Our working model can be found in Figure 1.



**Figure 1.** Moderation model for Hypothesis 2.

## Methods

### *Participants*

Data for the present investigation was derived from an archival dataset gathered between 2015 and 2017 within the Program for the Study of Infancy at East Tennessee State University. Participants were identified through the Tennessee Office of Vital Records and contacted by phone call. The interested parties completed five questionnaires at home, only one of which pertains to the current study, and brought these documents and their children to the laboratory for a one-time experimental session lasting around 45 minutes. The families were

compensated with a \$20 gift certificate for their participation. These sessions were videotaped, and the behaviors were coded by two of the authors from these recordings with strong reliability.

The sample used in the current research was comprised of 70 primarily white infants from mostly high-income families ( $M = \$68,758$ ,  $SD = \$51,503$ ) with the age ranging from 11 to 20 months of age ( $M = 15.47$ ,  $SD = 1.68$ ). There were 30 uniparous and 40 multiparous infants consisting of 32 girls and 38 boys. The number of siblings ranged from 0 to 4 with the average being .86 ( $SD = .91$ ; 30 had 0 siblings, 23 had 1, 15 had 2, 1 had 3, and 1 had 4). Sibling age ranged from 2 years old to 21 years old (mean age of siblings was 6.4 years old,  $SD = 4.1$ ), though all but one of these siblings were under 18 and would have still been living at home. Maternal age range was 21 to 41 years ( $M = 31.35$ ,  $SD = 4.78$ ) and the secondary caregiver ranged in age from 21 to 48 years ( $M = 34.8$ ,  $SD = 6.22$ ). Maternal education level was at least a four-year college degree (21 with a 4-year degree, 10 with a masters), and paternal education level most frequently being of a master's degree (14 with masters, 13 with a 4-year degree).

### *Initiating Joint Attention*

Following Salley and Dixon (2007), this investigation used the Picture Book Task from their adaptation of the Early Social Communication Scales (ESCS) (Mundy et al., 2003). In this session, the experimenter presented an opened picture book in front of the child for approximately 30 seconds so that the child could engage the pictures and initiate joint attention with the parent or experimenter. IJA bids were scored as high- and low-level bids with 1) higher-level bids being coded when the child exhibited pointing at a picture in the book or pointing while making eye contact with the experimenter or the parent (Salley & Dixon, 2007), and 2) lower-level bids being comprised of eye contact with experimenter or looking between

object and experimenter (Mundy & Gomes, 1998; Salley & Dixon, 2007). High- and low-level bids were combined for a total IJA score.

### *Language Measurement*

Prior to the study, mothers completed the *MacArthur-Bates Communicative Development Inventory* (MBCDI) *Words and Gestures* for productive and comprehensive language measures (Fenson et. al, 2007). These parental report forms are used for children aged 8- to 18-months to assess both understanding and production of vocabulary items that would be typical for infants in this age range. The scores of production and comprehension were assessed individually and assessed in combination during statistical analyses for a total language score to be used in comparison to the joint attentional bids performed during the experiment.

## **Results**

Means and standard deviations of IJA and language measures can be found in Table 1. Preliminary inferential analyses showed that older children had larger productive [ $r(30) = .50, p < .001$ ] vocabularies relative to younger children. Also, we were surprised to find that the ages of the infants in our investigation were not associated with the number of siblings in their homes since older infants would have been more likely to have younger siblings. Pearson product-moment correlations were computed to assess the relationships among parity, IJA, and language. In terms of Hypothesis 1, we found that IJA was not significantly associated with either language measure overall. There were, however, significant correlations for uniparous infants between high IJA and vocabulary production [ $r(30) = .50, p = .005$ ] and total IJA and vocabulary production [ $r(30) = .38, p = .039$ ]. This finding partially supported Hypothesis 2 in terms of the IJA-language relationship being stronger in uniparous homes than multiparous ones, though it

was only true for the productive vocabulary. This potential moderating effect of parity on the link between IJA and productive vocabulary was followed up with a more formal moderation-regression analysis in which each language measure was regressed on IJA, household parity, and the interaction term for these two variables (IJA x Parity). There were no significant moderating effects (at  $\alpha = .05$ ) of parity on the association of IJA with productive vocabulary or total language.

### **Discussion**

The purpose of this investigation was to explore whether household parity influenced the relationship between children's use of initiation of joint attention and their language proficiency. We reasoned that having older siblings would detract from infants' capabilities for using joint attention in the service of word-learning because of the distractions provided by having siblings in the home. We proposed that there would be significant correlations between IJA and overall language and that this correlation would be stronger among children in uniparous homes. Overall, our hypotheses were partially supported. There was not a significant correlation between IJA and language on the whole, but there was an association among only-children. Although this finding hinted at a moderating influence of parity, a formal test of moderation did not achieve statistical significance.

Among infants in uniparous homes, we found evidence of a significant correlation between IJA and vocabulary production. The lack of IJA-vocabulary relationship in multiparous homes is consistent with the possibility that parental engagement is divided among children in multiparous homes and that, therefore, multiparous children have less opportunity for language acquisition during joint attentional episodes. There were no significant effects of any of the variables on Low-Level IJA. The lack of this association may have been due to low variability

in that there were more than twice as many episodes of High-Level IJA (N = 66) compared to Low-Level IJA (N = 30).

Age was the only variable that was consistently associated with productive vocabulary and total language after controlling for total IJA, parity, and the IJA x Parity moderating variable. However, there were no significant effects of age, parity, or IJA on receptive vocabulary. In fact, not one of these variables was significantly correlated with comprehension, though some were correlated with total language (the combination of production and comprehension). It is not clear why comprehensive vocabulary was not correlated with child age in this sample. Indeed, we also observed that comprehensive vocabulary was not correlated with productive vocabulary. It could be that parents in this sample did not fully understand the instructions for completing the MBCDI.

This is the first study, to our knowledge, to examine household parity in relation to the association between IJA and language development. Since there was no previous literature on this topic involving parity, birth order literature was the only available information from which we could develop potential hypotheses. Although it may be true that parity has no moderating effect of on the IJA-language relationship, it is also possible that we had insufficient statistical power necessary to test for the effect. As this is a pioneering study on the topic, future research is necessary to understand this relationship further. Though overall, the hypotheses were not fully supported, the null findings may provide reassurance for families with multiple children that their younger children are not at an IJA-language acquisition disadvantage.

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**Table 1***Descriptive Statistics*

Variable	<i>M</i>	<i>SD</i>
High IJA	0.94	1.58
Low IJA	0.43	0.714
Total IJA	1.37	1.74
Comprehension	121.13	80.23
Production	28.96	45.75
Total Language	150.09	93.75
Mom age	31.35	4.78
Number of siblings	0.86	.91

*Note:* N = 70, High IJA = pointing behaviors, Total IJA = combined low and high initiating joint attention behaviors, Total Lang = combined production and comprehension scores from parental report of the *MacArthur-Bates Communicative Development Inventory (MBCDI) Words and Gestures*.