

Fathers' repetition of words is coupled with children's vocabularies

Introduction

Interactionist perspectives on language input and language learning

Importantly, the influence of particular features of language input on children's language outcomes depends on the language level of the child. One study showed that among 18-month-olds, parents' input quantity, as compared to diversity in vocabulary within the input, was more strongly associated with children's vocabulary skill one year later. However, by 30 months, parents' use of diverse vocabulary and rare words, as compared to input quantity, was more strongly related to children's vocabulary growth (Rowe, 2012). In addition to the role of caregivers' speech, children's own productions matter. Research has shown that earlier child speech predicts the quality of caregivers' speech later in development, suggesting mutual influence (Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010). These findings are consistent with Vygotsky's (1978) interactionist perspective on language learning, which suggests that parents can promote children's vocabulary growth at different time points in development by using features of language input that are best matched to children's level of understanding.

The idea of a "social feedback loop" between infants and parents (usually mothers) has been studied in many realms of child development research (see Warlaumont, Richards, Gilkerson, & Oller, 2014). Researchers have measured mothers' responsiveness to their infants, where a "response" is a time-locked change in mothers' behavior or speech that is contiguous with and contingent on children's actions or speech (see Tamis-LeMonda, Kuchirko, & Song, 2014, for a review). This type of responsiveness predicts the timing of children's language milestones, such as first words and combinatorial speech (Nicely, Tamis-LeMonda, & Bornstein, 1999; Tamis-LeMonda, Bornstein, Kahana-Kalman, Baumwell, & Cyphers, 1998), as well as the size of infants' receptive and expressive vocabularies (Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004; Tamis-LeMonda et al., 1998). Other studies have found that mothers dynamically change the prosodic features of their speech in response to infant feedback (Braarud & Stormark, 2008; Ko, Seidl, Cristia, Reimchen, & Soderstrom, 2016; Smith & Trainor, 2008). These results are consistent with various models of human development that emphasize the influence of reciprocal adult-child interactions. According to Shonkoff (2010), these models (e.g., the transactional model, the bioecological model) suggest that children play an active role in influencing their caregivers' interactions, and, thus, their own development. Not only does parents' language input likely influence children's language development, but also, differences in children's own language abilities and behaviors likely influence parents' speech to their children.

Repetition offers an ideal test case for interactionist models, as the amount of repetitiveness in parents' input has been shown to change over the course of children's development. Specifically, parents' repetition has been shown to peak when infants are 4 to 6 months of age and then to decline at approximately 24 months (e.g., Kaye, 1980; Stern, Spieker, Barnett, & MacKain, 1983). This pattern of change over time is also evident in studies of infants' attention to speech. For instance, McRoberts et al. (2009) played 6-month-olds several natural recordings of either mothers interacting with their 4- to 6-month-olds ("younger IDS [infant-directed speech]") or mothers interacting with their 12- to 14-month-olds ("older IDS"). The 6-month-olds showed a preference only for younger IDS and not for older IDS (relative to adult-directed speech). However, 6-month-olds did show a preference for older IDS if the stimuli contained more repetition, suggesting that repetition might be a particularly important component of speech for young infants. In contrast, a study with older infants showed that 12- and 16-month-olds continue to prefer speech with the prosodic features of infant-directed speech compared to adult-directed speech, but they do not prefer speech with the structural features of infant-directed speech, e.g., lexical repetition and short utterance length (Segal & Newman, 2015). Thus, it is possible that although repetition supports learning during early infancy (Newman et al., 2016) and in difficult lab tasks involving new words (Schwab & Lew-Williams, 2016), it may generally become less important for children's language learning over time, particularly as children gain familiarity with the words used most commonly in their environments. Based on this collection of findings, we hypothesize that parents tailor their use of repetition to the language level of their children, using less repetition as children make gains in language proficiency.

The role of fathers in promoting children's language development

Fathers' interactions with their children have been shown to contribute to children's outcomes (e.g., [Cabrera, Shannon, & Tamis-LeMonda, 2007](#); [Shannon, Tamis-LeMonda, London, & Cabrera, 2002](#)). For example, fathers' quality of caregiving accounts for unique variance in toddlers' scores on language and cognitive development assessments, over and above the influence of mothers' caregiving ([Pancsofar, Vernon-Feagans, & The Family Life Project Investigators, 2010](#); [Ryan, Martin, & Brooks-Gunn, 2006](#)). Moreover, fathers' responsiveness in parent-child interactions predicts children's language development (e.g., [Shannon et al., 2002](#); [Tamis-LeMonda et al., 2004](#)).

Interestingly, mothers and fathers display similarities, differences, and complementary behaviors when interacting with their children ([Berko-Gleason, 1975](#); [Cabrera, Fitzgerald, Bradley, & Roggman, 2014](#); [Shute & Wheldall, 1999](#)). Similarities in their infant-directed speech include the use of repetition ([Krupee & Uzgiris, 1987](#)), high pitch ([Shute & Wheldall, 1999](#); [Warren-Leubecker & Bohannon, 1984](#)), and shorter utterances ([Golinkoff & Ames, 1979](#)). Differences in their infant-directed speech include fathers' use of more wh- questions (as opposed to yes/no questions) and elicitation of more speech from children via clarification requests (e.g., [Rowe, Coker, & Pan, 2004](#)). Importantly, prior research has shown that fathers have an independent effect on children's language development (e.g., [Cabrera et al., 2014](#)), so the lack of data on the influence of specific features of fathers' infant-directed speech on children's language learning has likely underestimated the overall effect of parents' language input on language development. In addition, although several studies have examined fathers' contributions to children's developmental outcomes in low-income families (e.g., [Black, Dubowitz, & Starr, 1999](#); [Duursma, Pan, & Raikes, 2008](#); [Malin, Cabrera, Karberg, Aldoney, & Rowe, 2014a](#); [Pancsofar et al., 2010](#); [Rowe, Leech, & Cabrera, 2017](#)), few studies have examined the ways in which low-income fathers might adapt their speech to their children's level of understanding ([Malin, Cabrera, & Rowe, 2014b](#)).

The current study contributes to research on fathers' speech to their children—and its relation to children's language knowledge—by determining whether variation in low-income fathers' use of repetition aligns with their children's language abilities. Interestingly, fathers have been shown to be more challenging communication partners in some instances (e.g., in using more wh- questions and eliciting more speech) relative to mothers, and this seems to benefit children's language development. Children are able to rise to the challenge of communicating with fathers in these slightly more demanding interactions, as shown by the fact that their utterances are often longer when communicating with fathers than with mothers ([Rowe et al., 2004](#)), and that fathers' use of wh- questions with toddlers is positively related to children's language outcomes (e.g., [Rowe et al., 2017](#)). Therefore, fathers are likely to tailor their use of repetition to their children's language level, which for older infants and toddlers may mean using less repetition when their children have larger vocabularies (and instead providing more challenging language input).

The current study

In this study, we examined low-income fathers' repetition of words in the context of play interactions with their 2-year-old children. Given that children from low-SES (socioeconomic status) families have been shown to be at risk for language delays (e.g., [Fernald, Marchman, & Weisleder, 2013](#); [Nelson, Welsh, Trup, & Greenberg, 2011](#)), we wanted to examine the extent to which fathers adapt this feature of language input to their children's language level. Three different measures of repetition were used—type-token ratio, automated repetition index, and partial repetition coding (see Method for details)—to address whether variability in children's vocabulary size at 24 months is meaningfully related to repetition in fathers' input. Because prior literature has revealed wide variability in caregivers' speech even within SES groups (e.g., [Weisleder & Fernald, 2013](#)), we first aimed to quantify the amount of variability in the use of repetition and partial repetition of words across utterances in low-income fathers' speech to their 2-year-old children. Given that repetition may become a less helpful cue over time, we predicted that fathers would use less repetition if their children have larger vocabularies. Specifically, we predicted that the amount of repetition used by fathers would be

negatively correlated with children's concurrent vocabulary knowledge. Alternatively, however, the amount of repetition used by fathers could be positively correlated with children's concurrent vocabulary knowledge, given previous findings showing that repetitiveness in parents' speech to young infants predicts children's later vocabulary (Newman et al., 2016) and given the fact that researchers have not identified a threshold of language ability at which repetitiveness becomes less necessary for word learning in naturalistic interactions. Ultimately, in order to determine how we can best promote language learning in low-SES populations, it is important for researchers to examine variability in specific, naturally-occurring features of infant-directed speech within low-SES homes, and whether or not differences in these features are related to children's language outcomes.

Method

Participants

The current study used data from naturalistic interactions between low-income fathers and their 24-month-old children ($N = 41$). The data originally came from the Early Head Start Research and Evaluation Project (EHSREP), a randomized controlled evaluation of Early Head Start (EHS), which is a government-funded program in the United States designed to enhance children's health and development in families at or below the poverty level (Vogel, Xue, Moiduddin, Carlson, & Kisker, 2010). The sample used here came specifically from the Father Involvement with Toddlers Substudy (FITS; see Boller et al., 2006, for additional information on FITS) and includes English-speaking African American fathers and their 24-month-old children (22 girls and 19 boys). Fathers in this sample ranged from 18 to 52 years of age ($M = 29$ years, $SD = 8.96$). Fathers also varied in their years of educational attainment, but on average they earned a high school degree ($M = 12.5$ years of education, $SD = 1.47$, range = 10–16). As in Rowe et al. (2017), we included years of education as a control variable in our analyses because other studies within low-SES samples find that variation in parents' education level relates to differences in parents' speech and children's vocabulary development (e.g., Pan, Rowe, Singer, & Snow, 2005; Rowe, Pan, & Ayoub, 2005; for an exception, see Weisleder & Fernald, 2013). See Rowe et al. (2017) for additional characteristics of the father–child pairs in our sample.

Procedure

Father–child pairs were videotaped at home for 10 minutes of semistructured reading and play when children were 24 months of age. Each father was asked to play with his child using the contents of three bags that contained (a) a book (*The Very Busy Spider*), (b) a toy pizza and telephone, and (c) a toy barnyard with animals. The fathers were asked to play with the bags in this order, but they could divide the 10 minutes in any way they wanted. The experimenter also interviewed fathers and mothers to collect demographic information. Mothers completed the Words and Sentences short form of the MacArthur Communicative Development Inventory (MCDI), a checklist of 100 lexical items where parents indicate whether their children have produced each word (see Fenson et al., 2000). According to maternal report, children's productive vocabularies within this sample ranged from 14 to 93 of the 100 words ($M = 61.00$ words, $SD = 18.22$). One year later, when children were 36 months old, researchers visited the families in their homes and assessed children's receptive vocabulary using the Peabody Picture Vocabulary Test–Fourth Edition (PPVT; Dunn & Dunn, 2007) and assessed their verbal reasoning using the Mental Development Index (MDI) from the Bayley Scales of Infant Development–Second Edition (Bayley, 1993). Note that analyses involving the PPVT and MDI used reduced samples ($N = 36$ and $N = 34$, respectively) due to missing data from the latter visit. See Rowe et al. (2017) for more details on assessment methods.

Measures of input quantity and quality

Fathers' 10-minute interactions with their 24-month-old children were transcribed by trained research assistants using the CHAT conventions of the CHILDES (Child Language Data Exchange

System) database (MacWhinney, 2000). To ensure accuracy, each transcript was verified by a separate research assistant. Each line code for a different utterance, defined as a sequence of words that was preceded or followed by a change in conversational turn, intonation, or pause. Using the CLAN (Computerized Language Analysis) program (MacWhinney, 2000), we retrieved automated analyses of the total number of words (word tokens) spoken by fathers, our measure of overall quantity of speech. Our mea-

assessed at 36 months using the MDI from the Bayley Scales of Infant Development–Second Edition (Bayley, 1993). Using CLAN, we also obtained a measure of the total number of child word types used during the parent–child interaction at 24 months (i.e., the number of different word roots produced by children) as a secondary measure of children’s vocabulary knowledge.

Results

Variability in fathers’ language input

There was substantial variability in our measures of fathers’ input, in line with previous research

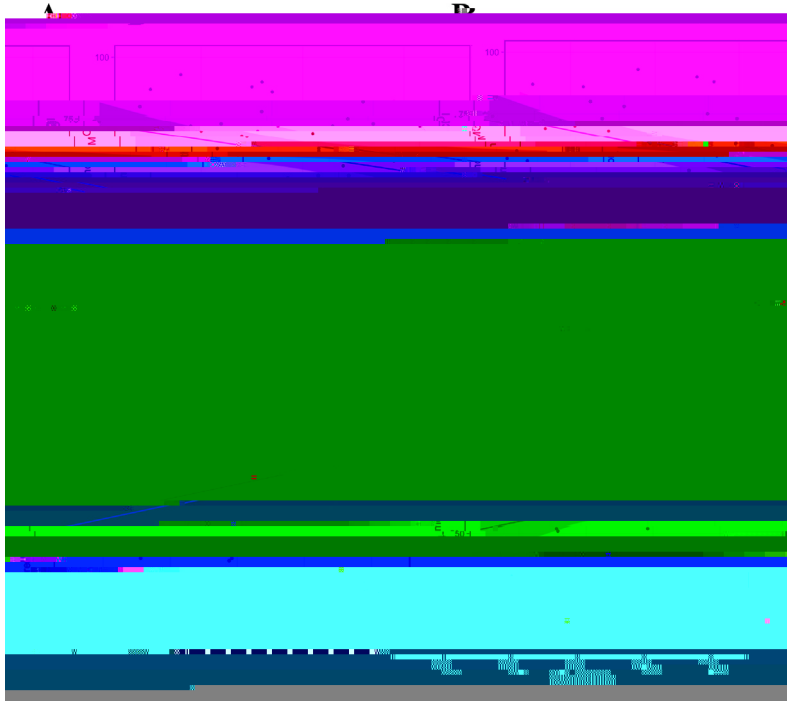


Fig. 1. Correlations between children's 24-month MCDI and each measure of fathers' repetition: (A) partial repetition, (B) repetition index, and (C) type-token ratio (TTR). Note that the star point in Panel C indicates the outlier that was excluded from

Next, we examined whether children's total number of word types (i.e., number of different word roots they produced) during the play interaction was related to fathers' repetition. That is, it is possible that, to the extent they differ, both children's general vocabulary knowledge (MCDI) and their vocabulary use in the specific interaction (word types) may be associated with fathers' input. Although

number of child word types was not significantly related to fathers' TTR ($r = .04$, $p = .81$) or fathers' repetition index ($r = -.14$, $p = .39$), there was a significant negative relation between number of child word types and fathers' partial repetition ($r = -.38$, $p = .01$). To further explore this relation, we added child word types to our regression models to determine whether child word types at 24 months predicted repetition in fathers' input, controlling for total quantity of input, fathers' years of education, and children's 24-month MCDI vocabulary scores. Children's MCDI scores and their number of word types used during the interaction were positively, but not significantly, correlated ($r = .23$, $p = .16$). Results displayed in [Table 2](#) show that children's 24-month word types were significantly associated with fathers' partial repetition ($p < .001$), controlling for fathers' education (ns), total quantity of fathers' speech ($p < .001$), and children's 24-month vocabulary scores ($p < .10$) (Model 3). Children's word types at 24 months were not significantly associated with fathers' TTR (Model 1) or repetition index (Model 2), controlling for the same variables (although note that again we did not control for fathers' total number of word tokens in predicting TTR). These results suggest that children's language knowledge—as displayed by the number of different word types children used within a conversational episode—was negatively related to fathers' use of partial repetition within that same conversational episode, controlling for fathers' education, children's MCDI scores, and fathers' total number of words spoken. That is, children who used more different word types had fathers who used less partial repetition across neighboring utterances.

Because we found negative relations between children's vocabulary knowledge and fathers' use of repetition in general, we wanted to address the possibility that fathers' repetition at this age might be negatively associated with children's later language outcomes. To do so, we examined whether repetition in fathers' speech to their 24-month-old children related to language outcomes at 36 months, as

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words in particular may be important for promoting children's learning of those words (Schwab & Lew-Williams, 2016).

One possible interpretation of our finding that 24-month-olds with larger vocabularies had fathers who used less repetition—and that children who produced more word types had fathers who used less partial repetition in particular—is that parents are sensitive to children's language knowledge and tailor their language input to their own children's developmental level. This interpretation is supported by previous research (Huttenlocher et al., 2010; Rowe et al., 2005; Snow & Ferguson, 1977; Vygotsky, 1978). In a study examining caregivers' speech over time with 14- to 36-month-old children, mothers from low-income families increased both their number of word tokens and types as their children became more proficient (Pan et al., 2005). But young children are not just passive listeners. Their social feedback to caregivers—such as moment-to-moment attentiveness and vocalizations—shapes caregivers' future language input (e.g., Ko et al., 2016; Nicely et al., 1999), and in turn, parental responsiveness promotes children's language development (e.g., Tamis-LeMonda et al., 2014). This active responsiveness to caregivers facilitates increasingly useful and informative interactions with caregivers.

Another possible interpretation of our findings is that fathers' use of more repetition at 24 months "caused" their children to have smaller vocabularies. If this was the case, it is likely that fathers' repetition at 24 months would also negatively relate to children's later vocabulary at 36 months. Yet our research revealed that repetitiveness in fathers' input to children at 24 months was not associated with either of our measures of language knowledge at 36 months (children's PPVT scores or MDI scores), controlling for concurrent vocabulary, suggesting that fathers' use of repetition did not seem to hinder children's language development. This finding also converges with research showing that although infant-directed speech seems to promote word learning early on in development (e.g., Ramírez-Esparza, García-Sierra, & Kuhl, 2014), this might not be the case for older toddlers (Ma, Golinkoff, Houston, & Hirsh-Pasek, 2011). Similarly, young children's ability to capitalize on parents' repetition of words over time might decline during the third year of life, as observed here. Importantly, however, it does not seem to be the case that hearing more repetition at 24 months is negatively related to children's vocabulary growth; rather, it may simply no longer be beneficial.

Although repetitiveness in fathers' speech to their 24-month-old children was not related to children's 36-month vocabulary or verbal reasoning in our sample, repetition could still be beneficial for this age group under certain circumstances. In particular, experimental evidence has shown that partial repetition of words in successive sentences is important for 2-year-olds' initial encoding of new words (Schwab & Lew-Williams, 2016). Thus, it is possible that when 24-month-olds are learning new object labels, hearing a word in immediate succession is initially beneficial, but it might not be as necessary with subsequent exposures to wordsegaortant9xmacti-1.3159TD4encet54.1(y)-30are224Fi04.3((0)

from both high- and low-SES families. This would facilitate a more complete understanding of how variation in these features interacts with different children's learning trajectories. However, our results are suggestive of two possible steps for parent-aimed interventions and early childhood programs. First, suggestions for enhancing parent-child interactions should be targeted to children's specific age and level of language knowledge. A "one size fits all" strategy for supporting language learning is not likely to be beneficial for all young children, and we currently know little about when and why certain types of input are more or less helpful for different children's language development. This is a prime opportunity for collaboration between basic cognitive scientists and, for example, speech-language pathologists. Notably, several speech therapy techniques already incorporate the use of repetition, including auditory bombardment, in which specific sounds are repeated (Bowen & Cupples, 1998), and focused stimulation, in which a child is exposed to multiple exemplars of a specific linguistic target (Ellis Weismer & Robertson, 2006). Second, the current study extends previous research showing the importance of fathers for promoting children's language development. Specifically, we show for the first time that repetition in low-income fathers' speech is related to children's language knowledge, providing further support for the idea that policies and programs should aim to include fathers as an important centerpiece of parenting.

Conclusions

Although repetition of words over time may be beneficial for children's language learning at early developmental time points, as well as for the initial encoding of new words slightly later in development, the current study suggests that repetition in fathers' language to their children does not broadly promote children's language learning during the third year of life. Instead, within our low-SES sample, fathers seem to tailor their speech—and in particular their use of repetition—to the language level of their children. This research highlights a key idea for future research on the influence of language input on children's learning: that specific features of language input are beneficial to children at different time points of development and across different contexts. In designing interventions that target early language learning, simple messages to parents such as "more repetition is good" or "more repetition is bad" are not accurate or beneficial. Instead, it is important for caregivers to cater their language to children's maturing vocabulary knowledge. In support of efforts to improve the effectiveness of policies, interventions, and early childhood programs, our findings indicate that fathers provide responsive and valuable support for children's language growth over time.

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