Stories for Success: Culturally-Driven Maternal Influences on Children's Language Development

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Abstract

Maternal speech holds a pivotal role in infant language development. Mothers differ cross-culturally in terms of responding to infant inquiries for information, providing word labels, and incorporating emotional talk into conversations with infants (Tamis-Lemonda et al., 1992). Thus, understanding how mothers communicate with their infants and also how race, socioeconomic status, and education level of the mother impact this process is essential. In the current study, mother-infant dyads ($N = 50$) participated in an interactive picture-book task. Our sample consisted of 26 self-identified Black mothers and 24 self-identified White mothers. Infants were aged 10, 14, 18, or 22 months. The observational session was recorded, transcribed, and coded to analyze maternal total word count, discrete word count, and parts of speech. Results indicated that Black sons received significantly less total words ($p < .01$), discrete words ($p < .04$), verbs ($p < .02$), and pronouns and proper nouns ($p < .02$) than Black daughters and White sons. Additionally, no measure of maternal speech was able to predict the receptive vocabulary of Black or White infants. However, while no measure was able to predict the productive vocabulary of Black infants, adjectives ($p < .001$), total words ($p = .03$), and total positive emotion words ($p = .03$) spoken by a White mother were able to predict the productive vocabulary of White infants. This study has important implications for the early vocabulary and literacy gap between Black and White children in the United States, as well as improving our understanding of word learning across both cultures.

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Stories for Success: Culturally-Driven Maternal Influences on Children's Language Development

How a mother communicates with her infant can impact her child's vocabulary development and even literacy later in life. Research has shown that culture, education level, and socioeconomic status (SES) can influence how a mother communicates (Fernald, Marchman, & Weisleder, 2012), which in turn can affect the way her infant learns to speak and conceptualize novel thoughts. The practice of picture-book reading is a common one among mother-infant dyads, and as such, provides a window into better understanding the nature of maternal speech and its influence on child language acquisition from the time of infancy itself.

A major contribution to infants' vocabulary occurs towards the end of their first year of life when infants begin to identify other human beings as independent, goal-oriented individuals (Golinkoff & Hirsh-Pasek, 2006). From this point forward, infants begin to acquire the skill of deciphering speaker intent and increasing their vocabulary size. Previous research highlights that mothers modify the way they speak in order to match their infant's changing language abilities (Bornstein et al., 1999). Mothers provide simple descriptions and labels for words during their infant's first year of life, but then shift to using novel words and more complex labels as the infant ages (Tamis-LeMonda et al., 2014). Scaffolding, or the ability to alter social learning based on a learning or developmental timeline, is another important concept of early language development (Goldin-Meadow et al., 2007). For example, an infant in his or her first year of life may gesture towards a novel food during meal time, perhaps to indicate curiosity or acquire more information from the mother, as opposed to when he or she has a wider vocabulary bank to identify different foods a year later.

Maternal responses to infant speech are usually spontaneous. As a result, these responses serve as instantaneous, yet valuable learning opportunities for the infant. A longitudinal study conducted by Goldin-Meadow et al. (2007) focused on 10 mother-infant dyads during playtime

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and mealtime, beginning when the infants were 10 months old and concluding when they were

24 months old. These age ranges were chosen because one-word speech in infants begins

between 10-14 months of age, and two-word utterances start between 17-23 months of age. It

was found that when a mother translated an infant's gesture into speech, that word was

significantly more likely to later become a part of the infant's vocabulary than when she did not

translate the word. Additionally, results showed that infants first formed two-word speech around

19.3 months of age and that the infants whose mothers more frequently responded to their

gestures and utterances developed two-word speech earlier in their development.

     During an infant's second year of life, the point at which he or she begins understanding

words and forming small phrases independently, maternal responses to actions and gestures can

predict infant vocabulary size and quality of communication (Tamis-LeMonda et al., 2014).

Some social learning is intentional; a child may engage a social partner, such as a parent, in joint

attention and acquire a word label in the process. Joint attention refers to the process of two

individuals sharing attention upon a common object or event, usually initiated by one individual

gazing, gesturing, or using verbal cues to draw in the attention of the other individual towards the

common object or event (Akhtar & Gernsbacher, 2007). However, infants may also pick up new

words when hearing conversations in their environment, either amongst other individuals or

between themselves and another individual. Golinkoff & Hirsh-Pasek (2006) offer one potential

explanation that younger infants learn and produce novel words slowly, but during their second

year of life, after acquiring more social referencing skills, learn at a much faster pace. Regardless

of the environment, infants are able to learn new words rapidly once they have identified that

other human beings with whom they engage in communication are intentional, social beings.

Building on the vocabulary they attain from adult's word descriptions and responses to their gestures, infants by 20 months of age on average have a bank of productive vocabulary and are able to put words together to form small multi-word combinations. Productive vocabulary refers to a vocabulary that an individual can use regularly in speech. Bornstein, Tamis-LeMonda, and Haynes (1999) observed mother-infant dyads at two different stages, when the infants were 13.2 months and then 20.4 months of age, during free play and mealtime. These age ranges were chosen because by 13 months of age infants on average are forming their first words. All of the infants were Caucasian, first-born, and belonging to middle-to-upper SES households. There was a significant increase in vocabulary size of infants during both playtime and mealtime from 13 to 20 months of age. At 13 months of age, contextual variations between infants' vocabulary in playtime versus mealtime were not found. However, 20 month-old infants used more vocabulary while playing than in mealtime, indicating that infants after a certain age may be able to distinguish between different contexts and accordingly use more or less of certain types of words. Furthermore, mothers increased verbal responses from when their infants were 13 months to when they were 20 months of age. Mothers replied more frequently to their infants during playtime than mealtime when their infants were 20 months old. Both of these findings indicate that mothers do tailor their responsiveness to their infant's vocabulary. Finally, it was also found that maternal verbal responsiveness predicted child vocabulary better than maternal vocabulary itself. This last result indicates that the number of words a mother speaks to her infant is not the only driving force in the infant's ability to develop language skills.

It is also possible that emotions expressed through language, types of labels provided, and meaning behind certain words or phrases could influence language development as well. Pan and colleagues (2005) conducted a longitudinal study on 108 native English-speaking mother-

infant dyads during a picture book and toy task when infants were 14, 24, and 36 months of age. It was found that diversity in maternal vocabulary (i.e. different word types) predicted an increase in child vocabulary production. This effect was especially salient when the child was around 24 months of age. Moreover, maternal word diversity predicted an increase in child vocabulary production more strongly than quantity of maternal speech. Learning is context-dependent, and how much one knows may not be as important as the way in which one conveys knowledge when helping another individual learn.

The way mothers respond to infants and to which gestures they most frequently respond can differ as a function of race and culture, since the language content and speaking style of mothers may differ across cultures. Previous research also indicates that parents differ cross-culturally in terms of which infant gestures or explorations they respond to most and also the way in which they respond. Tamis-Lemonda and colleagues (1992) studied 38 American and 40 Japanese toddlers, all of whom were around 14 months of age and whose families were from middle-to-upper SES backgrounds, during a free play session. Overall, results indicated that American mothers were more likely to respond to infant object play, such as playing with toys, whereas Japanese mothers more frequently reacted to infant social play, such as playing among or with others. Cross-culturally, the infants comprehended more than they produced. In comparison to their Japanese counterparts, American infants had more nouns and non-nouns in their productive and receptive vocabulary. Productive vocabulary refers to the words an individual can regularly use, while receptive vocabulary refers to the words an individual can recognize or understand. In line with this finding, American mothers tended to label objects and describe various aspects of the play environment more than Japanese mothers. In comparison, Japanese toddlers exceeded American toddlers in symbolic play, and Japanese mothers both

demonstrated and also encouraged more symbolic behavior in their infants. Language acquisition is not unidimensional, and findings such as the aforementioned demonstrate that the way in which infants learn is a flexible process. Thus, understanding cross-cultural learning behaviors is the first step in incorporating novel techniques into potential interventions focusing on improving literacy outcomes for children from diverse backgrounds.

Another cross-cultural study analyzed 24 Caucasian American, 24 Caucasian French, and 24 Japanese mother-child dyads in their homes (Bornstein et al., 1992). All children were 5 months old. Overall, it was found that American mothers directed their 5 month old infants' attention to the environment more than French and Japanese mothers of the same aged infants. In contrast, Japanese mothers directed their infants' attention towards themselves more frequently. These different interactions between mother and child could distinctly influence how the child learns to react to his or her environment, contextualize information, and incorporate new words into his or her vocabulary.

Research indicates that another component of cultural vocabulary differences is that oral narrative skills, which further translate into the ability to discern characters' motives, beliefs, and internal states and thus understand the story at a deeper level, is a strength of Black children (Gardner-Neblett, Pungello, & Iruka, 2012). In comparison to their European American counterparts, Black children have more vigorous narrative quality, production, and comprehension abilities (Gardner-Neblett et al., 2012). Overall, this demonstrates that Black children have the foundation for strong reading comprehension. These differences in vocabulary development can impact Black and White children differently as they age. Reese, Leyva, Sparks, and Grolnick (2010) provided either elaborative reminiscing or dialogic training to low-income mothers whose kids were in Head Start programs. Dialogic reading refers to the process of

parents asking their children questions while reading a book regarding the contents on the pages in order for the child to learn novel words. Elaborative reminiscing refers to making the reading experience subjective, including asking children to relate events in a book to their own life or asking children open-ended questions about the narrative. In the study, it was found that children had higher narrative quality scores and story comprehension if their mothers had received elaborative reminiscing training rather than dialogic training. Children of African, African American, or Hispanic mothers had stronger narrative quality than children of White mothers overall. It is important to note that neither maternal elaborative reminiscing nor dialogic reading training had a positive effect on children's expressive vocabulary (Reese et al., 2010). These results indicate that mothers assisting children in contextualizing information and relating it to personal experiences helps children acquire stronger narrative skills. However, this does not mean that children will automatically have a larger vocabulary. Furthermore, maternal involvement in child language acquisition is an important, but not a singular factor in determining potential vocabulary development.

In the United States today, there exists an achievement gap between Black and White children across all education levels in that Black children are falling behind their White peers (Matthews, Kizzie, Rowley, & Cortina, 2010), despite the previously mentioned strengths relating to language that are common among Black children. Another achievement gap has also emerged in recent times with respect to gender: female students on average outperform their male peers. This discrepancy in academic outcomes as a function of gender is actually more apparent among Latino and African American populations (Matthews et al., 2010). For this reason, it is essential to understand that language development is context-dependent and culturally-variable. Furthermore, differences in vocabulary and literacy cannot merely be

attributed to race of the mother or gender of the infant alone, as there could be reasons why a specific cultural group places priority on certain verbal interactions over others, thereby potentially driving differences in language development.

Evaluating the impact of SES on infant language acquisition is important as well, given that there are variations across SES in terms of verbal and cognitive abilities in children starting from a young age (Fernald et al., 2012). Ultimately, this leads to a lack of preparation for academic success by the time of kindergarten in children from low socioeconomic backgrounds as compared to their peers from middle socioeconomic backgrounds (Bojczyk, Davis, & Rana, 2016). One study evaluated the effects of SES, focusing on 68 children between the ages of 8 and 15 (Maguire et al., 2017). SES was determined based on maternal education level. Subjects completed various standardized tests evaluating vocabulary, reading, and working memory, as well as a novel experimental word learning task. Results demonstrated that mothers with higher education levels had children with more advanced vocabulary. A significant relationship between maternal SES, vocabulary knowledge of the children, and percentage of words learned by the children was found as well. However, SES and reading skills (comprehension and decoding) or SES and working memory did not similarly significantly relate to percentage of words learned by the children. This finding is salient because reading comprehension and working memory are skills considered important for word learning. Ultimately, this shows that it may be more important to tailor literacy strengthening strategies to the process of word learning, as the effect of SES and maternal education is not unilateral on child vocabulary growth. This study also highlights the importance of helping children develop a linguistic context to better comprehend what they learn, so that they can then connect novel words and ideas back to pre-existing information. Moreover, while this study looked at children between the ages of 8 to 15, it is

important to fill in an important gap in the literature by examining SES at a much younger age when they are only infants.

Current Study

Much of the existing literature on mother-infant interactions focuses predominantly on White, middle-to-upper SES families. There is a need to further explore how race and culture of the mother impact an infant in learning language, and whether certain practices in maternal speech are more predictive of vocabulary acquisition than others. Given that parenting behaviors also impact infants' social and emotional development, it is important to consider factors in addition to race such as SES and geographic location as well, all of which together contribute to the overall environment in which parenting occurs (Humphries, Strickland, & Keenan, 2014).

How mothers communicate with their infants varies cross-culturally. While certain factors have been studied individually, there is still a need to further evaluate both the separate and combined effects of maternal culture, SES, and education level on infants' language development. Studying the impacts of culture and SES on mother-child interactions across development could prove beneficial in reducing the achievement gap and improving learning outcomes for children from diverse backgrounds. Furthermore, there is limited knowledge of the exact parts of speech that mothers across cultures use when speaking to their infants and how these different parts of speech could potentially influence infants' vocabulary development. The current study analyzes the impact of mothers' culture, education level, and SES on speech content directed at infants as analyzed through an interactive picture-book task. Although race does not fully encompass culture, race will be used as a proxy for culture in order to streamline study design, with the study comparing White and Black mother-infant dyads in the United States.

Hypotheses

Because research has shown that Black children have stronger narrative quality, production, and comprehension skills than their White peers (Gardner-Neblett et al., 2012), it was hypothesized that White mothers will use more total words than Black mothers, but Black mothers will use more discrete words than White mothers.

There has been little, if any, previous research focusing on the exact parts of speech breakdown in the language of White versus Black mothers. Nonetheless, because research has shown that White mothers tend to focus on word labeling during interactions with their infants (Tamis-Lemonda et al., 1992) and because oral narrative skills are a strength of Black children (Gardner-Neblett et al., 2012), it was also hypothesized that White mothers would use more nouns and pronouns than Black mothers during the picture book task while Black mothers would use more emotion words, verbs, and adjectives. In general, nouns, pronouns, and proper nouns are used when labeling objects while verbs, adjectives, and emotion words may be used more for describing actions or traits when crafting a narrative. Thus, these hypotheses were accordingly formulated.

Furthermore, since the verbal and cognitive abilities in children may vary from a young age as a function of SES (Fernald et al., 2012), both maternal education level and household income are expected to be significant predictors of infants' receptive and productive vocabulary in both the Black and White sample. Both maternal education level and household income were chosen to be evaluated separately because attaining a higher education level can often, but not always, lead to earning a higher income. While previous studies have often used SES as a composite variable encompassing education level (Maguire et al., 2017), we chose to evaluate the variables separately.

Method

Participants

The sample consisted of 50 mother-infant dyads, 26 Black and 24 White, who partook in a picture book task in the Wilbourn Infant Lab at Duke University. This task is one part of a larger, ongoing study evaluating mother-infant interactions. Mother-infant pairs were recruited to participate in the study using a public database of birth records from Durham, Wake, or Orange county in North Carolina. There were 25 male infants, of whom 14 were Black and 11 were White, and 25 female infants, of whom 12 were Black and 13 were White. All mothers self-identified their race.

The mothers on average were well-educated and belonging to the upper-middle class, with 78% having a 4-year degree or higher and about 61% earning $60,000 or above per year. Infants were either 10 months (46%), 14 months (14%), 18 months (22%), or 22 months (18%) in age. To account for potential differences caused by age differences among the infants, age was controlled for in all analyses concerning maternal language. Education levels ranged in ascending order from 1-5 signifying the following: no degree, highschool, some college, bachelor's degree, or graduate/professional school. 87.5% of White mothers had a bachelor's degree or higher while 69.3% of Black mothers had a bachelor's degree or higher. However, there was no significant difference in the distribution of education across Black versus White mothers, $\chi2(4, N = 50) = 3.32, p = .51$. 79.2% of White mothers earned $60,000 or above while 44% of Black mothers earned $60,000 or above, indicating that the White sample on average had a significantly higher annual income ($\chi2(1, N = 49) = 6.38, p = .01$), despite both groups being comparable across education levels. Thus, income was controlled for in all further analyses concerning maternal language.

Materials and Procedures

Prior to starting the study, a trained experimenter led the participants through the informed consent process. Mothers then gave their written consent to participate in the study. All participating mothers also provided written consent to be video recorded during the study as per Duke University Institutional Review Board (IRB) protocol. Then the mother took a seat at the table in the testing room, holding her baby on her lap. The *No David!* picture book was situated on the table facing the mother-infant dyad. The experimenter informed the mother that she had up to ten minutes to read through the story at her own pace with her infant "as she would at home." If they finished the task earlier, they could call out "All done!" or something similar and the experimenter would return inside the room. The experimenter also informed the mother that while reading, if at any time she felt that her child did not feel comfortable to continue reading, she could end the task early. The experimenter then exited the room so the task could begin. While the dyad read, the experimenter waited outside the closed testing room.

Every session was recorded using two digital video cameras on tripods that were placed in front of and behind the mother-infant dyad during the picture book task. Upon completion of the study, the videos were saved on QuickTime. Once the dyad completed the study, the experimenter gave the mother demographic forms to fill out about herself and her infant including information on her race, ethnicity, household income, marital status, and education level. The mother also filled out the MacArthur Short Form vocabulary checklist about her infant, based on which the receptive and productive vocabulary information of each infant was obtained. Mothers had the option to leave any question unanswered. Upon completion of the study, each infant received a picture book or t-shirt as an expression of gratitude for his or her

participation in the study. All videos and information about the participants were kept confidential in line with the Duke University IRB.

Coding

All recorded sessions were transcribed line-by-line exactly as heard by trained research assistants. After the first pass translation, each transcript underwent a second accuracy check transcription by a different research assistant. Once each session had been transcribed twice, the total start and stop time of each picture book task was noted in order to calculate the length of each reading session per participant. Furthermore, each transcript was inputted into an online total and discrete word calculator, and the obtained total and discrete word count values were also noted. The completed transcripts were then uploaded to *NVivo 12.2.0* and *Dedoose* for qualitative coding. The following coding scheme was developed focusing on five categories: nouns, pronouns and proper nouns, verbs, adjectives, and emotion words. Two research assistants acquired inter-rater reliability of 90% on *NVivo 12.2.0*, and then used the coding scheme to code each transcript sentence-by-sentence on *Dedoose*.

Analytical Strategy

Chi-square analyses were run in order to determine if there were cultural or gender differences with respect to the total time mothers read the picture book to their infants, as well as whether there were cultural differences with respect to the education or household income distribution of the mothers. Partial Pearson correlations were run to analyze if any relationships existed between total book time and total words and also total book time and discrete words, controlling for age group. Then, 2 (Mother's Race: Black vs. White) x 2 (Infant's Gender: male vs. female) between-subjects analyses of variance (ANOVAs) were run in order to assess whether the total words or discrete words used by the mother differed based on mother's culture

or infant's gender, and also to evaluate if any significant interactions between mother's culture and infant's gender emerged.

Next, a 2 (Mother's Race) x 2 (Infant's Gender) multivariate analysis of variance (MANOVA) was conducted in order to evaluate if all parts of speech overall used by the mother differed based on mother's culture or infant's gender, and also to evaluate if any significant interactions between mother's culture or infant's gender emerged. To further evaluate the specific differences in parts of speech, 2 (Mother's Race) x 2 (Infant's Gender) between-subjects ANOVAs were run in order to assess whether the nouns, pronouns and proper nouns, verbs, adjectives, and emotion words spoken by the mother differed based on mother's culture or infant's gender, and also to evaluate if any significant interactions between mother's culture or infant's gender emerged. A 2 (Mother's Race) x 2 (Household Income: above $60,000 vs. $60,000 and below) MANOVA was also conducted to evaluate if all the different parts of speech differed based on mother's culture or household income, and also to evaluate if any significant interactions between mother's culture and household income emerged. 2 (Mother's Race) x 2 (Household Income: above $60,000 vs. $60,000 and below) between-subjects ANOVAs were run in order to assess whether total emotion words spoken by the mother differed based on mother's culture or household income, and also to evaluate if any significant interactions between mother's culture and household income emerged.

Next, MANOVAs were conducted in order to evaluate if receptive or productive vocabulary of infants differed based on mother's culture, gender of infant, education, or household income, and also to evaluate if any significant interactions emerged. Next, partial Pearson correlations between total words, discrete words, and book time and receptive or productive vocabulary of Black infants and White infants were run, again controlling for age

group. Partial Pearson correlations controlling for age group were also run to determine whether

any relationships between any of the parts of speech and the receptive or productive vocabulary

of Black and White infants existed. Finally, a linear regression was run to determine whether the

different parts of speech overall could significantly predict the receptive or productive

vocabulary for Black and White infants. To follow up, stepwise multiple linear regressions were

run to ascertain which specific parts of speech would best predict the receptive or productive

vocabulary of Black and White infants. An alpha level of .05 was used for all analyses.

Results

Picture Book Totals

Book Time. The duration that mothers read to their infants, total book time, was recorded

in seconds. There was a nonsignificant main effect of Mother's Race on book time, $\chi^2(1, N = 49)$

$= 0.58$, $p = .45$, $\eta_p^2 = .013$, and Infant's Gender on book time, $\chi^2(1, N = 49) = 0.15$, $p = .70$, $\eta_p^2 =$

.003. There was also no significant interaction between Mother's Race and Infant's Gender,

$\chi^2(1, N = 49) = 2.73$, $p = .11$, $\eta_p^2 = .06$. A significant partial correlation emerged on the

relationship between book time and total words, $r = .716$, $p <.001$, and also the relationship

between book time and discrete words, $r = .644$, $p <.001$, when controlling for age. Thus, book

time was also controlled for in all further analyses concerning maternal language.

Total Number of Words. Black mothers used less total number of words ($M = 499.16$, SD

$= 264.00$) than White mothers ($M = 579.13$, $SD = 219.14$) during the picture book task,

indicating a marginally significant main effect of Mother's Race on total number of words used,

$F(1, 48) = 2.93$, $p = .09$, $\eta_p^2 = .065$. Girls received a greater total number of words ($M = 543.76$,

$SD = 232.53$) than boys ($M = 532.67$, $SD = 260.13$), indicating a significant main effect of

Infant's Gender on the total number of words used by the mother, $F(1, 48) = 6.09$, $p = .02$, $\eta_p^2 = $

.13. These effects are qualified by a significant Mother's Race by Infant's Gender interaction,

$F(1, 48) = 6.38$, $p = .02$, $\eta_p^2 = .13$. Black mothers spoke significantly less total words to their

boys ($M = 398.62$, $SD = 178.86$) than to their girls ($M = 608.08$, $SD = 303.76$), $F(1, 24) = 7.59$, p

$= .01$, $\eta_p^2 = .28$. White mothers speak more total words to their boys ($M = 691.09$, $SD = 257.44$)

than to their girls ($M = 484.38$, $SD = 124.90$), a difference that is approaching statistical

significance $F(1, 23) = 3.48$, $p = .08$, $\eta_p^2 = .16$. White mothers ($M = 691.09$, $SD = 257.44$) also

used significantly more total words than Black mothers ($M = 398.62$, $SD = 178.86$) when

speaking to their male infants, $F(1, 23) = 10.68$, $p = .004$, $\eta_p^2 = .36$. However, there was no

significant difference in the total number of words used by White mothers ($M = 484.38$, $SD =$

124.90) and Black mothers ($M = 608.08$, $SD = 303.76$) when speaking to their female infants,

$F(1, 24) = 0.50$, $p = .49$, $\eta_p^2 = .02$. Taken together, these findings suggest that Black boys receive

significantly less total words than White boys and Black girls from their mothers (see Figure 1).

Total Number of Discrete Words. Black mothers used less discrete words ($M = 159.08$,

$SD = 52.29$) than White mothers ($M = 184.13$, $SD = 42.29$) during the picture book task,

indicating a significant main effect of Mother's Race on number of discrete words used, $F(1, 48)$

$= 6.58$, $p = .01$, $\eta_p^2 = .14$. Boys received a greater number of discrete words ($M = 171.63$, $SD =$

54.05) than girls ($M = 171.08$, $SD = 44.37$) overall, indicating a significant main effect of

Infant's Gender on the number of discrete words used by the mother, $F(1, 48) = 6.38$, $p = .02$, η_p^2

$= .13$. There was no significant interaction between Mother's Race and Infant's Gender on the

number of discrete words used, $p > .10$ However, when conducting a-priori analyses evaluating

differences in discrete words within both samples, it was found that the main effect of Infant's

Gender was reflective of the trend for the White mother sample only. Black mothers spoke

significantly more discrete words to their girls ($M = 175.33$, $SD = 59.23$) than boys ($M = 144.08$, $SD = 41.76$), $F(1, 24) = 4.81$, $p = .04$, $\eta_p^2 = .19$, whereas White mothers spoke significantly more discrete words to their boys ($M = 204.18$, $SD = 49.73$) than girls ($M = 167.15$, $SD = 26.19$), $F(1, 23) = 6.59$, $p = .02$, $\eta_p^2 = .26$. White boys ($M = 204.18$, $SD = 49.73$) received significantly more discrete words than Black boys ($M = 144.08$, $SD = 41.764$, $F(1, 23) = 11.03$, $p = .004$, $\eta_p^2 = .37$. However, there was no significant difference between the number of discrete words that White female infants ($M = 167.15$, $SD = 26.19$) and Black female infants ($M = 175.33$, $SD = 59.23$) received, $F(1, 24) = 0.10$, $p = .75$, $\eta_p^2 = .005$. Taken together, these findings suggest that Black male infants receive significantly less discrete words than White male infants and Black female infants from their mothers (see Figure 2).

Parts of Speech

First, it was evaluated whether Mother's Race or Infant's Gender differentially impacted all parts of speech overall (i.e., nouns, pronouns and proper nouns, verbs, adjectives, and emotion words). There was a statistically significant difference in parts of speech used by the mother based on Infant's Gender, $F(5, 40) = 2.68$, $p = .035$, Wilk's $\Lambda = 0.75$, $\eta_p^2 = .04$. There was no significant difference in all parts of speech used based on Mother's Race, $F(5, 40) = 1.67$, $p = .17$, Wilk's $\Lambda = 0.83$, $\eta_p^2 = 0.17$, and also no significant interaction between Mother's Race and Infant's Gender on parts of speech used, $F(5, 40) = 1.76$, $p = .14$, Wilk's $\Lambda = 0.82$, $\eta_p^2 = .18$.

Nouns. Female infants ($M = 95.00$, $SD = 43.09$) received significantly more nouns than male infants ($M = 89.48$, $SD = 46.51$), $F(1, 49) = 12.23$, $p = .001$, $\eta_p^2 = .22$. There was no significant main effect of Mother's Race ($p > .05$) and no significant interaction between Mother's Race and Infant's Gender on number of nouns used ($p > .05$).

Pronouns and Proper Nouns. White mothers ($M = 129.96$, $SD = 61.10$) used significantly more pronouns and proper nouns than Black mothers ($M = 105.69$, $SD = 52.79$), $F(1, 49) = 5.53$, $p = .02$, $\eta_p^2 = .11$. There was no significant main effect of Infant's Gender on number of pronouns and proper nouns used. However, a statistically significant interaction between Mother's Race and Infant's Gender emerged qualifying the main effect of Mother's Race, $F(1, 49) = 6.81$, $p = .01$, $\eta_p^2 = .13$. Male Black infants ($M = 87.50$, $SD = 38.09$) received significantly less pronouns and proper nouns than female Black infants ($M = 126.92$, $SD = 60.88$), $F(1, 25) = 5.87$, $p = .02$, $\eta_p^2 = .21$, and also significantly less pronouns and proper nouns than White male infants ($M = 161.73$, $SD = 68.84$), $F(1, 24) = 11.25$, $p = .003$, $\eta_p^2 = .35$. There was no significant difference in the number of pronouns and proper nouns received between Black female and White female infants ($p > .05$) or White male and White female infants ($p > .05$).

Verbs. White mothers ($M = 169.63$, $SD = 66.99$) used significantly more verbs than Black mothers ($M = 138.35$, $SD = 76.88$), $F(1, 49) = 5.47$, $p = .02$, $\eta_p^2 = .11$. There was no significant main effect of Infant's Gender on number of verbs used. However, a statistically significant interaction between Mother's Race and Infant's Gender emerged, $F(1, 49) = 7.03$, $p = .01$, $\eta_p^2 = .14$. Male Black infants ($M = 112.29$, $SD = 52.39$) received significantly less verbs than female Black infants ($M = 168.75$, $SD = 91.20$), $F(1, 25) = 6.11$, $p = .02$, $\eta_p^2 = .22$, and also significantly less verbs than White male infants ($M = 206.73$, $SD = 69.97$), $F(1, 24) = 18.00$, p < .001, $\eta_p^2 = .46$. There was no significant difference in the number of verbs received between Black female and White female infants ($p > .05$) or White male and White female infants ($p > .05$).

Adjectives. There was neither a significant main effect of Mother's Race nor a significant main effect of Infant's Gender on number of adjectives used. There was also no significant

interaction between Mother's Race and Infant's Gender on number of adjectives used (all $ps >$ .05).

Emotion Words. Emotion words were analyzed overall and also broken down into positive emotion words and negative emotion words. There were no significant main effects or interaction effects on total number of emotion words, positive emotion words, or negative emotion words used (all $ps > .05$). Positive emotion words fell into one of the following three categories: the word "happy," the word "excited," or "other positive valence," into which any other word indicative of positive emotion was coded. There were no significant main effects or interaction effects on usage of the words "happy" or "excited." However, a main effect of Mother's Race emerged indicating that Black infants ($M = 0.38$, $SD = 0.64$) received more other positive valence words than White infants ($M = 0.04$, $SD = 0.20$), $F(1, 49) = 5.21$, $p = .03$, $\eta_p^2 = .11$.

Negative emotion words fell into one of the following three categories: the word "sad," the word "angry," or "other negative valence," into which any other word indicative of negative emotion was coded. There were no significant main effects or interaction effects on usage of the words "sad" or "angry." However, a main effect of Mother's Race emerged indicating that Black infants ($M = 1.50$, $SD = 1.84$) received more other negative valence words than White infants ($M = 0.50$, $SD = 0.83$), $F(1, 49) = 4.87$, $p = .03$, $\eta_p^2 = .100$. Additionally, a main effect of Infant's Gender emerged indicating that female infants ($M = 1.40$, $SD = 1.92$) received more other negative valence words than male infants ($M = 0.64$, $SD = 0.86$), $F(1, 49) = 9.92$, $p = .003$, $\eta_p^2 = .18$.

It was also evaluated whether household income differentially impacted all parts of speech overall (i.e., nouns, pronouns and proper nouns, verbs, adjectives, and emotion words).

No main effect of income on all parts of speech overall emerged, $F(5, 35) = 0.71$, $p = .62$, Wilk's

$\Lambda = 0.91$, $\eta_p^2 = .09$. However, a post-hoc Bonferroni test revealed a significant interaction

between Mother's Race and Household Income on total emotion words, showing that Black

infants from a household with an annual income at or below \$60,000 received significantly more

total emotion words ($M = 4.34$, $SE = 0.59$) than Black infants from a household with an annual

income above \$60,000 ($M = 1.84$, $SE = 0.81$), $F(1, 21) = 5.83$, $p = .03$, $\eta_p^2 = .22$. There was no

significant difference in total emotion words received between White infants from households

with an annual income of above \$60,000 and White infants from households with an annual

income at or below \$60,000, $F(1, 23) = 0.97$, $p = .34$, $\eta_p^2 = .05$.

Infant Vocabulary

There was no significant main effect of Mother's Race, Infant's Gender, Household

Income, or Mother's Education on the receptive or productive vocabulary of the infant (all $ps >$

.05). There were no significant correlations between total words, discrete words, or book time

and the receptive or productive vocabulary of Black infants. There was a significant, positive

partial correlation between total words spoken by the mother and the productive vocabulary of

White infants, $r = .46$, $p = .03$, and also a marginally significant, positive partial correlation

between discrete words spoken by the mother and the productive vocabulary of White infants, r

$= .37$, $p = .08$, when controlling for age. There was no significant correlation between book time

and the receptive or productive vocabulary of White infants ($p > .05$).

There were no significant correlations between any of the parts of speech and the

receptive or productive vocabulary of Black infants (all $ps > .05$). There were no significant

correlations between any of the parts of speech and the receptive vocabulary of White infants (all

$ps > .05$). There was a significant, positive partial correlation between adjectives and the

productive vocabulary of White infants, $r = .51$, $p = .01$. There was a marginally significant,

positive partial correlation between pronouns and proper nouns and the productive vocabulary of

White infants, $r = .40$, $p = .06$, and also a marginally significant, positive partial correlation

between nouns and the productive vocabulary of White infants, $r = .37$, $p = .09$, when controlling

for age.

Linear regression analysis was used to evaluate if all the different parts of speech (i.e.,

nouns, pronouns and proper nouns, verbs, adjectives, and emotion words) overall could

significantly predict the receptive or productive vocabulary for Black or White infants. The full

model was not significantly predictive of the receptive vocabulary of Black or White infants ($p >$

.05). The full model was also not significantly predictive of the productive vocabulary of Black

infants ($p > .05$). However, it was found that the full model, which held all the parts of speech

variables as equally important, did significantly predict the productive vocabulary of White

infants, $F(5, 18) = 3.66$, $p = .02$. The correlation coefficient was .71, indicating that

approximately 50% of the variation in the productive vocabulary of White infants could be

accounted for by the different parts of speech used by their mothers, $R = .71$, $R^2 = .50$.

A stepwise multiple regression was first conducted to evaluate which part of speech was

the strongest predictor of the productive vocabulary of all infants. At step 1 of the analysis, total

emotion words entered into the regression equation and was significantly predictive of the

productive vocabulary of all infants, $F(1, 48) = 4.40$, $p = .04$. The correlation coefficient was .29,

indicating that approximately 8% of the variation in the productive vocabulary of all infants

could be accounted for by the total emotion words used by their mothers, $R = .29$, $R^2 = .08$.

A stepwise multiple regression was then conducted to evaluate which part of speech was

the strongest predictor of the productive vocabulary of White infants. At step 1 of the analysis,

adjectives entered into the regression equation and was significantly predictive of the productive

vocabulary of White infants, $F(5, 22) = 17.11$, $p < .001$. The correlation coefficient was .66,

indicating that approximately 44% of the variation in the productive vocabulary of White infants

could be accounted for by the adjectives used by their mothers, $R = .66$, $R^2 = .44$.

Lastly, a stepwise multiple regression was conducted to evaluate which category of

emotion words (either total positive emotions or total negative emotions) was the strongest

predictor of the productive vocabulary of Black and White infants. At step 1 of the analysis, total

positive emotions entered into the regression equation and was significantly predictive of the

productive vocabulary of White infants, $F(1, 22) = 5.08$, $p = .03$. The correlation coefficient was

.43, indicating that approximately 19% of the variation in the productive vocabulary of White

infants could be accounted for by the total positive emotion words used by their mothers, R =

.43, $R^2 = .19$. Neither positive nor negative emotion words were significant predictors of the

productive vocabulary of Black infants.

Discussion

The current study aimed to evaluate culturally-driven influences on maternal speech

during a picture book task and investigate how these potential speech differences could predict

infants receptive and productive vocabularies. Differences based on gender of the infant were

also considered. To carry out this investigation, a sample of Black and White mothers and their

infants from southeastern United States were selected.

It was found that Black mothers spoke significantly less to their male infants with respect

to total words, discrete words, verbs, and pronouns and proper nouns in comparison to their

female infants, while White mothers spoke significantly more discrete words to their male

infants and displayed a trend towards significance in terms of total words spoken to their male

infants in comparison to female infants. No such qualitative difference emerged when comparing

total or discrete words spoken by White and Black mothers to their female infants. Thus, overall,

Black sons received significantly less total words, discrete words, verbs, and pronouns and

proper nouns than Black daughters and White sons. Taken together, these findings demonstrate a

specific cultural pattern based on gender of the infant, namely that Black male infants receive

fewer words relative to both Black female infants and White male infants. This finding is more

nuanced than there just being a main effect of race, especially because there were no significant

differences in the distribution of education levels of White versus Black mothers and income was

also controlled for.

Cultural differences, regardless of income and education level, could be what are driving

the variations in maternal speech and infant word learning, especially with respect to how

mothers speak to their sons. This finding adds further clarity to previous research that focus on

the achievement gap with respect to race and gender. Overall, poorer academic outcomes are

observed among Black children than White children across all education levels (Matthews et al.,

2010). A comparatively more recent gender achievement gap has also formed, with female

students on average outperforming their male peers: a gender difference that has been shown to

be potentially heightened among Latino and African American populations (Matthews et al.,

2010). Thus, this could explain why Black female infants received more total words, discrete

words, verbs, and pronouns and proper nouns than their Black male peers. With respect to the

White mother-infant dyads sample, the gender achievement gap trend did not hold true. One

explanation for this is that it is possible that White mothers may be aware that boys may not like

to read as much as girls or are not as successful in learning how to read as girls, and thus require

more attention and should be spoken to more during something like a picture-book task. So,

when White mothers come across a picture-book task, especially one with the main character

being a male, they aim to create more connections between the character of David and their own

sons.

It is possible that another factor driving these interactions between gender and culture

may be that Black mothers are consciously or unconsciously aiming to provide more linguistic

input to their daughters in order to ensure that they not fall behind in society later in life.

Furthermore, the character of David in the picture book is male, thus both Black and White

mothers may approach reading the picture book in a similar manner if they have daughters,

which could explain why there were no significant differences in how mothers spoke to their

female infants across both cultures. However, for the mothers who have a son, the experience of

reading this picture book may vary based on their cultural background. Additionally, although

David is racially ambiguous, he is not Black, and so he may have been more accessible to White

mothers than Black mothers. Perhaps this is why he was potentially not viewed in the same way

by Black mothers as the White mothers.

The way in which both Black and White mothers spoke during the picture book task was

not directly related to their infants' receptive vocabulary. Given that an infant develops receptive

vocabulary first in life, and then expands his or her productive vocabulary with age (Taylor et al.,

2013), this particular finding was unexpected because at least some part of speech was expected

to be related to the receptive vocabulary of the infants. It is possible that because receptive

vocabulary in this study referred to a specific list of words found on the MacArthur Short Form

vocabulary checklist, there may have been other words that the infant could have understood that

were not accounted for due to the fact that this particular vocabulary assessment did not

incorporate those words. Furthermore, it is possible that being able to recall all words the infant

can understand may be difficult for the mother, thus leading to reporting errors. Conversely,

being able to remember and identify a word that her infant can actually say, a productive word,

could be easier for the mother.

The way in which Black mothers spoke during the picture book task was not directly

related to their infants' receptive or productive vocabulary. However, while the speech of White

mothers was also not significantly related to the receptive vocabulary of their infants, certain

trends did exist with respect to the productive vocabulary of their infants. The National

Assessment of Educational Progress reports have shown that African American and

Hispanic/Latino children fall behind their White peers in terms of reading and writing (Ma et al.,

2017). Thus, the biggest gap in vocabulary between White and Black children would be expected

to be observed in their productive vocabularies. For this reason, it is important to be able to

understand the factors that may be salient in contributing to productive vocabulary. It was found

that if the quantity of the different parts of speech--namely nouns, pronouns and proper nouns,

verbs, adjectives, and emotion words--that White mothers use is known, then the productive

vocabulary of their infants can be predicted. In particular, positive emotion words, adjectives,

and total number of words used by White mothers during the picture book task were predictive

of their infants' productive vocabularies.

There were no significant differences in the receptive or productive vocabularies of Black

versus White infants as a function of their mother's educational level or household income.

Furthermore, the average productive and receptive vocabularies for Black and White infants in

our sample were not significantly different. However, findings demonstrated significant

differences in the way in which maternal speech impacted the vocabulary of Black versus White

children, despite the fact that Black and White mothers in this sample had comparable education

levels and that all analyses were conducted while controlling for household income. This

indicates that Black infants are learning, just in a different manner than White infants. Thus,

some factor above and beyond education or income differentially impacts the way in which

Black and White infants learn.

One plausible explanation for this could be that for a White mother, especially a middle-

income White mother, the process of picture-book reading may represent an active learning

environment. White mothers may approach a picture-book reading task with the expectation to

teach, while White children may form the expectation over time of learning from the picture

book. However, this interaction may not be conducive to language development in the same way

for Black children. Since Black children have been shown to display strong oral narrative quality

(Gardner-Neblett et al., 2012), perhaps Black communities value physical movement and usage

of their bodies to enhance learning. This process of moving while using and hearing language

and utilizing the body to manipulate learning involves using the body within the larger context of

learning. Piaget emphasized that children learn through doing and using their five senses (Blake

and Pope, 2008), a tradition that is not well-suited for our modern education system in the United

States. However, perhaps Black families have culturally preserved the importance of learning

through interactive settings, and so both Black mothers and Black infants approach activities

such as playtime as an opportunity to learn. Additionally, a picture-book task is generally a one-

on-one session. While this type of interaction may be familiar as a learning opportunity for

White families, this may not be the case for Black families. In comparison to White

communities, Black communities are often more communal, focusing on interdependence and

interchangeable family roles (Soli, McHale, and Feinberg, 2009). For this reason, it is possible

that Black children could be learning from their siblings or other extended relatives, not just their

mother, and so the influence of the mother alone on language development may not be as pronounced for a Black infant as it would be for a White infant. Thus, Black children may benefit more from receiving different verbal inputs from a variety of sources with respect to developing their language skills.

This study revealed that adjectives, total words, and total positive emotion words spoken by White mothers were all significantly related to their infants' productive vocabularies. Thus, an intervention focusing on enhancing the receptive or productive vocabulary of children could involve teaching White mothers to speak more to their children from the time of infancy. However, redundancy, or the idea that it is about speaking more, may only be relevant with respect to White mothers. Trying to get Black mothers to speak more, at least during a picture book task, may not be the most salient way to predict or increase the vocabulary of their infants, given that none of the types of speech were significant predictors of the receptive or productive vocabulary of Black infants in our study. Learning a language is a context-dependent process that can vary across cultures. The context of picture-book reading may not be utilized as a teaching opportunity by Black mothers or as a learning opportunity by Black children. For a Black mother, reading a picture book to her infant could be more of an opportunity to spend time together rather than to teach.

Finally, it was found that Black infants from a household with an annual income at or below $60,000 received significantly more total emotion words than Black infants from a household with an annual income above $60,000. This could be because Black mothers from lower socioeconomic backgrounds have experienced potentially emotionally salient experiences and life situations that lead them to characterize and emphasize thoughts, emotions, and feelings when speaking.

Limitations and Future Directions

Since the way in which Black mothers spoke during the picture book task was not directly related to their infants' receptive or productive vocabulary, understanding the context in which Black kids are learning and building vocabulary is essential. This study demonstrated the need to find a more sensitive measure to understand how and in what context the speech of Black mothers impacts their infants' vocabulary, given that the patterns found within the White mother sample do not match those found in the Black mother sample. Given that Black and White infants may learn language differently based on the cultural context, it would be beneficial to evaluate the impact of maternal speech on child vocabulary during playtime tasks as well. Due to the interactive nature in which Black children commonly learn, it is possible that the way in which Black mothers speak to their infants during playtime may be more predictive of their infants receptive and/or productive vocabularies.

Furthermore, although certain parts of speech did appear to be predictive of the productive vocabulary of White infants, our findings emerged from a study conducted during a single, specific segment of the infant's developmental timeline (10, 14, 18, or 22 months of age). It would also be beneficial to repeat a similar study with a longitudinal sample, and have the infants take a standardized vocabulary assessment at different intervals as they age in order to further assess the predictive effects of maternal speech.

Although the White and Black mother samples had comparable education levels and any differences in household income were controlled for, both groups were still well-educated and belonging to the upper-middle class overall. In the future, expanding the samples to include mothers across a broader range of income levels and educational backgrounds could help in assessing whether the observed results are generalizable to the larger American population.

Since research has shown that fathers' speech content may differently, but nevertheless valuably impact the vocabulary development of children in comparison to that of mothers (Pancsofar, Vernon-Feagans & The Family Life Project Investigators, 2010), analyzing the interactions of Black and White fathers with their male and female infants could provide further insight into culturally-driven influences on infant vocabulary development.

Understanding cultural differences in maternal speech and how this process impacts infants' language development is a complicated process, given the multitude of cultures and subcultures that exist both in the United States and worldwide. This is made further complex when culture and gender interact such that males and females are differentially impacted with respect to word learning even within the same cultural context. Nonetheless, continuing to conduct studies evaluating specific cultural groups would be beneficial to improving literacy outcomes and the quality of tailored interventions. Within the context of the United States, acquiring a better understanding of maternal speech of Hispanic/Latino mothers and the way in which this could impact the vocabulary development of their infants would be beneficial, given the literacy gap that also exists between White children and their Hispanic/Latino peers (Ma et al., 2017).

Conclusion

The current study was able to demonstrate that Black sons receive significantly less total words, discrete words, verbs, and pronouns and proper nouns than Black daughters and White sons during an interactive picture book task with their mothers. These findings suggest that simply focusing on race of the mother would lead to a limited way of conceptualizing language development and word learning in infants. The effect of a mother's culture on infant vocabulary growth is complex given that maternal speech can vary considerably cross-culturally, and even

more so when accounting for gender differences that may exist within each culture. Furthermore, while certain parts of maternal speech of White mothers were able to predict the productive vocabularies of White infants, no such trend emerged in the Black participant sample, despite the fact that Black and White infants did not significantly differ in terms of their receptive or productive vocabulary at the time of the study. This is essential to acknowledge because any efforts to improve literacy and vocabulary outcomes for Black children in the United States must take into account that the process of word learning for this group may be starkly different than that of White Americans, and thus, interventions must be uniquely tailored to account for these cultural nuances.

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Table 1

Culture Main Effects for Parts of Speech Used

	Black		White		
	M	*SD*	*M*	*SD*	*F*
Nouns	89.88	48.39	94.79	40.65	1.06
Pronouns and Proper Nouns	105.69	52.79	129.96	61.10	5.53*
Verbs	138.35	76.88	169.63	66.99	5.47*
Adjective	26.23	20.94	32.88	20.14	2.24
Emotion Words	3.46	2.76	2.13	2.29	3.06

Note. $*p < .05$.

Table 2

Gender Main Effects for Parts of Speech Used

	Male Infants		Female Infants		
	M	*SD*	*M*	*SD*	*F*
Nouns	89.48	46.51	95.00	43.09	12.23***
Pronouns and Proper Nouns	120.16	64.61	114.52	50.94	2.19
Verbs	153.88	76.27	152.88	71.76	3.21
Adjective	29.88	21.13	28.96	20.53	1.59
Emotion Words	2.88	2.19	2.76	3.02	1.56

*Note. ***p < .001.*

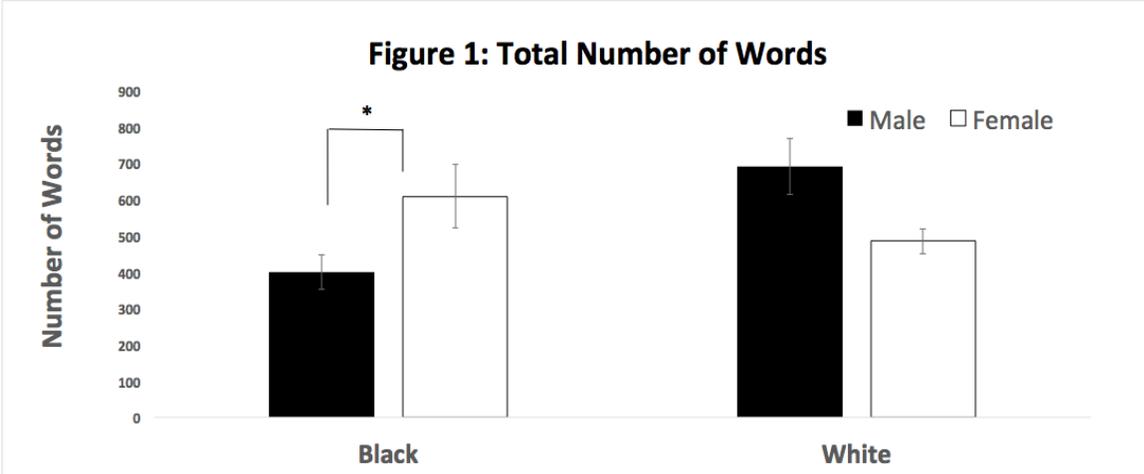**Figure 1: Total Number of Words**

Figure 1. Total number of words spoken by mothers during the picture book task in terms of race of mother and gender of infant. Error bars represent standard errors. Asterisk indicates significant difference between groups, $p < .01$.
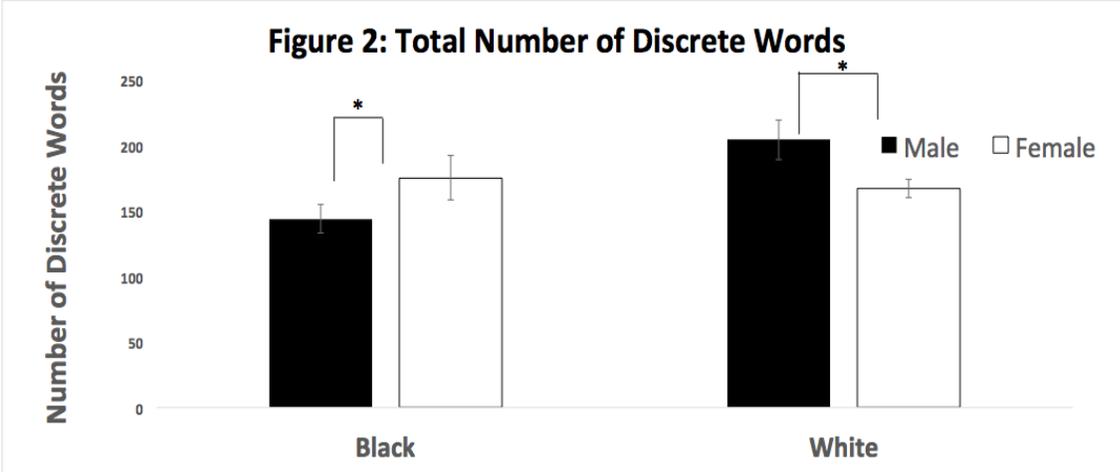
Figure 2. Discrete number of words spoken by mothers during the picture book task in terms of culture and gender. Error bars represent standard errors. Asterisk indicates significant difference between groups, *p* < .01.