Rural and urban differences in language socialization and early vocabulary development in Mozambique

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Abstract

We investigate the amount of speech and (co-speech) gestures addressed to infants at 1;1 years of age in rural and urban Mozambique, and correlate these amounts with vocabulary size measured at 1;5 and 2;1. We found that urban infants are exposed to more than three times as much speech and co-speech gestures than rural infants. The results show that the amounts of co-speech gestures and speech predict later vocabulary development in the urban community, but not in the rural community. The results further show that rural infants are delayed in their vocabulary development, which may in part be explained by a transition in the socialization style rural infants experience between the age of 1;1 and 1;5.

Keywords: Child language acquisition; child-directed speech; co-speech gestures; vocabulary development; Mozambique.

Introduction

When children learn language, they must have exposure to the target language. It is well established that the amount of exposure correlates strongly to vocabulary development (Hart & Risley, 1995; Pan, Rowe, Singer, & Snow, 2005). This does not only hold for the amount of speech children are exposed to, but also for the amount of gestures directed at children (Iverson, Capirci, Longobardi, & Caselli, 1999; Rowe & Goldin-Meadow, 2009). In this report we investigate how the amounts of speech and gestures addressed to infants vary among rural and urban communities in Mozambique, and show how these amounts correlate with vocabulary sizes during infants' early development.

One obvious predictor of children's vocabulary development is the amount of verbal input addressed to them. Various studies have, indeed, revealed a strong correlation between parental verbal input and vocabulary development (Hart & Risley, 1995; Pan et al., 2005). It is not just the amount of words a child is exposed to, but also the variety of words that correlates to later vocabulary size (Hart & Risley, 1995). It has further been found that the amount of parental verbal input addressed to children, as well as the speed of children's vocabulary development, relates to the parents' social economic status (SES) – the higher the parents' SES, the more words they tend to address to children, and the larger these children's vocabularies become (Hart & Risley, 1995).

As with speech, the amount of hand gestures addressed to infants, such as pointing, showing, or iconic gestures, are good predictors of vocabulary development (Iverson et al., 1999; Pan et al., 2005). Infants' gesture use also predicts vocabulary size (Pan et al., 2005), possibly due to a correlation between parental gesture use and infants gesture use (Iverson et al., 1999). As with the amount of speech, SES predicts the amounts of parents' and infants' gesture use, which relates to later vocabulary size (Rowe & Goldin-Meadow, 2009). One explanation for the role that gestures have on vocabulary development is that gestures help to establish and sustain joint attention, which in turn supports vocabulary development (Carpenter, Nagell, Tomasello, Butterworth, & Moore, 1998).

It is important to realize that most of these studies were carried out in industrialized societies, but socialization towards children can differ greatly across cultures, and many non-industrial cultures have different attitudes towards child rearing (Schieffelin & Ochs, 1989). For instance, there are cultural differences regarding the amount of socialization a child is involved in - typically there is relatively little speech directed towards infants from non-industrialized cultures (Lieven, 1994). Moreover, multi-party interactions are more frequent in non-industrialized than in industrialized communities, and infants tend to have multiple caregivers, including siblings (Brown, 2011; Harkness, 1977). Also, the amount of language socialization depends on the developmental status of a country - mothers from countries higher on a developmental scale tend spend more time stimulating their children by reading books, telling stories, naming, counting and other cognitive tasks (Bornstein & Putnick, 2012).

Within culture differences may exist between urban and rural communities. Keller (2012), for instance, has proposed that, in addition to prototypical Western urban communities, there are prototypical rural and urban communities in non-industrialized countries. She has described a number of key characteristics in which non-industrialized rural and urban communities differ. The subsistence-based farming lifestyle

in rural communities, for instance, demands from children that they develop motoric skills and knowledge of social rules. Verbal skills are considered less important. Urban societies tend to be higher educated and expect from their children to receive a good education as well. As a result, linguistic interactions tend to become more important (LeVine et al., 1996). However, non-Western urban communities still adhere to many cultural traditions rooted in their rural decent, such as the role of communal responsibilities from the extended family members in child rearing (Keller, 2012).

In sum, these observations predict that infants from non-industrialized urban communities would be exposed to more child-directed speech than infants from rural communities. Since there is a tight link between speech and gesture (McNeill, 1985), we would expect to find similar differences regarding the use of gestures and co-speech gestures addressed to infants. A previous analysis of the same observations presented in the present paper, however, has revealed no significant differences between a rural and an urban community in Mozambique regarding the amount of social interactions that young infants have with the members of their extended families (Mastin & Vogt, 2013). These social interactions were based on the infants' attention states (Bakeman & Adamson, 1984), and include both verbal and non-verbal interactions. This raises the question whether there are actual differences in the amount of speech addressed to the infants.

Based on the above-mentioned studies, which have demonstrated that speech and gestures are sound predictors for vocabulary development, we further expect to find that the amounts of speech, gestures, and co-speech gestures predict later vocabulary. In this paper, we try to confirm these predictions using a longitudinal ethnographic study among infants from rural and urban Mozambique.

Methods

Participants and field sites

We selected two field sites in Mozambique: one site compiled from two adjacent residential suburbs in the country's capital of Maputo; the other site was made up of three small villages just outside the rural, provincial town of Chokwe in Gaza province, about 200 kilometers away from the capital. From each community we recruited 22-25 families with an infant in the range of 1;0 to 1;2 years old (1;1 on average) at the start of our study. Our local research assistants explained the general purpose and procedures of our study to the participating families in their native language, and we obtained a signed informed consent from the infants' mothers. During the course of our longitudinal study, we lost various participants due to illness, mortality or relocation. In addition, we removed two participants from our analysis, because the parental reports on vocabulary development showed a decrease in expressive vocabulary, which rendered their data unreliable. As a result, we provide results for 14 participants from each field site.

The participants from the rural community were all native Changana speakers (a Southern Bantu language spoken in parts of Mozambique and South Africa); in most cases this was the only language spoken in the household. Only in a few families was another related local language occasionally spoken. In the urban community, most families raise their children bilingually in Mozambique's official language of Portuguese, and Ronga, a language that is mutually intelligible with Changana. Table 1 shows some demographic information concerning our participants.

Table 1: Demographic information. *Note*: Primary education in Mozambique is organized in two levels of primary school: EP1 for 5 years and EP2 for another 2 years.

Participant information	Rural (*n*=14)	Urban (*n*=14)
Males / Females	7 / 7	9 / 5
Avg age (SD)	1;1.8 (0;0.26)	1;1.6 (0;0.28)
Education level mothers		
None	6	1
EP1	5	5
EP2	3	6
Higher	0	1

There was a fairly balanced split in the number of males and females participating, and the average age was equivalent in both sites. To have an indication of the families SES, we report the mothers' education level. The majority of rural mothers have either completed no education or only the lower levels of education, whereas urban caregivers have all received some education: five mothers have completed the lowest level of education, six have the second level of education, and one has received secondary education. Since the data on education is ordinal, we performed Fisher's exact test to verify whether the education levels of both communities differ significantly and found that it appears not (p=.115). However, when we compared the rural community with the urban community from our (unpublished) norming study using the Chi-squared test, we found a significant effect in educational level ($\chi^2(3)=32.414$, $p<.001$), while the urban participants' education fits nicely with our norming study ($\chi^2(3)=1.318$, $p=.725$).

Materials

We adapted the MacArthur-Bates Communicative Development Inventories (MBCDI) Short Form Vocabulary Checklist (Fenson et al., 2000) into both Portuguese/Ronga and Changana to obtain a parental checklist of words used to measure vocabulary size and development in both Mozambican communities. To do this, we compiled a list

from Fenson et al.'s Level I for infants and extended this with 13 additional items from the Level II checklist to allow the list to be used for children older than 16 months. We then identified vocabulary that was not applicable to the environment, culture or lifestyle of our participants, and replaced these items with appropriate vocabulary that matched the same syntactic or semantic functions as the original English word. The list was further adapted during extensive piloting of the checklist. With the adapted CDIs we conducted a norming study in both communities to obtain expected values of vocabulary development. For details on the adaptation and norming of the MBCDI, consult Mastin and Vogt (2013).

Data collection

Data was collected longitudinally at three periods during the course of one year, while the infants were on average 1;1, 1;5 and 2;1 years old. At each time-period, we visited each family twice. At the first visit, we administered a short survey with questions concerning the demographics of our participants. We also videotaped the infants' interactions with their families to allow them to accommodate to our presence. During the second visit, we started with video taping the infants from 45 up to 75 minutes during natural free behavior for data analysis. At both visits, we instructed the families to continue their daily routines and to act as if we were not present. After the video recording was finished, the adapted MBCDI was administered through face-to-face interviews held by a local research assistant to estimate the infants' vocabulary development. In the current study, we report on the video recordings at 1;1 and correlate these to the infants' expressive vocabulary at 1;5 and 2;1 as measured using the MBCDI.

Coding procedures

The videos recorded during the second visits were coded for 30 minutes in segments of prolonged duration in which the infant was displaying 'natural' behavior (i.e.: not sleeping, not off camera, not interacting with or disturbed by the experimenters). We also excluded prolonged periods (roughly more than 2 minutes) of breastfeeding, as this might have introduced a bias toward dyadic interactions. For this article, we present results on only child-directed speech and gestures.

Child-directed utterances Two local research assistants, while closely supervised by the authors, transcribed all child-directed speech. All intelligible speech was first transcribed into the local language and subsequently translated into Portuguese. All unintelligible speech were coded as unknown vocalizations, but were included in our current analyses. Because not all speech was intelligible, we measured the number of utterances (i.e. individual speech acts), rather than number of words.

Gestures We coded gestures during episodes of joint engagement (Mastin & Vogt, 2013), which are activities in which the infants are socially interacting with one or more other individuals. These activities involve dyadic person interactions, as well as different types of triadic joint attention interactions based on those defined by Bakeman and Adamson (1984). Since many interactions observed involved multi-party interactions, we only coded those gestures produced by the communication partner nearest to the child. We adopt a broad definition of gestures as any physical activity with the hand or body that has a clear communicative intent (Zukow-Goldring, 1996). The following gestures were coded:

- *Pointing* is a gesture where the gesturer extends the arm to indicate an object with the hand or index finger from some distance.
- *Showing* is a gesture in which an object is indicated using zero proximity, e.g. by tapping on the object or by holding up the object.
- *Demonstrating* is a gesture where the speaker manipulates an object to show the infant how that object is used, or the type of actions that can be performed upon it.
- *Reaching* occurs when someone extends his/her arm to obtain or to touch an object, but can (or does) not reach this object. Also requests for objects by extending the hand were included in this category.
- *Offering* occurs when the speaker offers (or gives) an object or good to the infant.
- *Taking* occurs when someone takes over possession of an object from someone else.
- *Conventional gestures* comprises gestures that are symbolic of nature, such as emblematic gestures, but also gestures that bear an iconic relationship with their referent. For example, waving bye-bye, or indicating the size of the target object with the hands.
- *Ritualized play* accounts for all ritualized interactions or displays that occur between infants and communication partners. For instance, dancing, clapping hands or turn-taking games, such as patty-cake.
- *Embody* occurs when someone directs another by physically "putting them through the motions of some activity" (Zukow-Goldring, 1996, p. 200), provided this has a communicative (or otherwise intentional) function. For example, placing the child on the mother's lap, pushing the infant in a certain direction, or taking someone's hand to demonstrate an action.
- *Request for attention* comprises any gesture that seeks for the attention of the interaction partner.

For the present study, we collapsed all gesture categories and report on the average number of gesture tokens addressed to the infants.

Both authors coded approximately half of all videos each, after which the coding was assessed and refined using improved coding schemes twice by trained research assistants. Both authors then coded approximately 20% of

the video material to calculate inter-rater agreement with the final results. The resulting Cohen's kappa was measured to be 0.67 (84.9% agreement), which according to Landis and Koch (1977) can be classified as 'substantial'.

Co-speech gestures After coding all gestures, we marked those gestures accompanied by a child-directed utterance as a co-speech gesture. We report the average number of co-speech gestures addressed to infants.

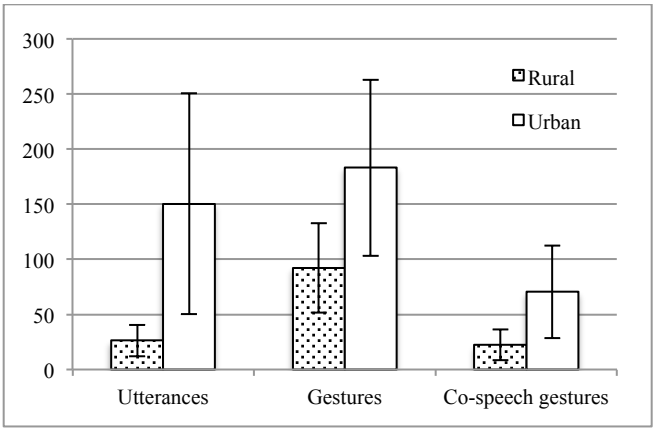

Figure 1: This figure shows the average amounts of child-directed utterances, gestures and co-speech gestures in the rural and urban areas at 1;1. Error bars indicate standard deviations. All differences between communities are significant (p<.001).

Results

Figure 1 shows the average number of utterances, gestures and co-speech gestures addressed to the infants from the rural and urban communities. The graph reveals that urban communication partners address substantially more utterances, gestures and co-speech gestures than their rural counterparts. The number of child-directed utterances observed in the urban community is 5.7 times higher than observed in the rural area (according to the Mann-Whitney U test, U=8; p<.001). The number of gestures – both with or without simultaneous speech – is 2.0 times higher in the urban community than in the rural (U=29; p=.001). The frequency of child directed co-speech gestures occurs 3.2 times more in the urban community (U=22, p<.001).

Table 2: Spearman correlations r_s of total amounts of child directed utterances, gestures and co-speech gestures at 1;1 with expressive vocabulary development at both 1;5 and 2;1. *Note:* *p<.05.

	At 1;5		At 2;1	
	Rural	Urban	Rural	Urban
Utterances	-0.178	0.554*	0.055	0.607*
Gestures	-0.270	0.482	0.256	0.508
Co-speech gestures	-0.061	0.667*	0.139	0.520

Table 2 shows the Spearman correlations between the amounts of utterances, gestures and co-speech gestures produced at the infants' age of 1;1 and expressive vocabulary sizes at infants' ages of 1;5 and 2;1. The first observation we can make is that urban child-directed utterances and co-speech gestures have significant correlations to expressive vocabulary size at 1;5 (utterances: $r_s[14]=0.554$, p<.05; co-speech gestures: $r_s[14]=0.667$, p<.05) and at 2;1 (utterances: $r_s[14]=0.607$; p<.05). Note that all other correlations from the urban community approach significance (p<.10). The second observation is that from the rural community, no significant correlations with vocabulary are revealed.

Given the differences in the amount of cognitive stimulation between both communities, we would expect to also see differences in the language development between the two communities, and we do (Table 3). The urban infants have a substantially larger expressive vocabulary than the rural infants. According to a two-way ANOVA on *Age x Site*, we see a main effect for age ($F(2,78)=79.91$; p<.001) and for site ($F(1,78)=13.41$; p<.001), and no interaction (p=.221). A Tukey post-hoc test confirms the main effect of age (p<.001).

Table 3: The average scores and standard deviations on expressive vocabulary from the MBCDI at 1;5 and 2;1 for both field sites. *Note*: Differences between urban and rural are significant as indicated with *p<.05 and **p<.01.

	At 1;5	At 2;1
Rural	17.71 (12.23)	50.85 (23.59)
Urban	29.00 (19.61)*	72.92 (23.18)**

Discussion

The objective of this paper is to investigate whether infants from rural Mozambique experience less verbal and non-verbal stimulation than infants from urban Mozambique, and to assess how this correlates to later vocabulary development. The results clearly demonstrate that there are substantial differences between the rural and urban communities at all measured levels, i.e. the amounts of speech (as measured in utterances), gestures and co-speech gestures. This confirms Keller's (2012) predictions, but appears in contrast to our earlier findings that the total amounts of social interactions the same infants engage in – whether these are verbal or non-verbal – are roughly the same in both communities (Mastin & Vogt, 2013).

The difference in child-directed stimulation between rural and urban is largest regarding the number of utterances, which is 5.7 times higher in the urban community than in the rural community. This is considerably more than the difference in the amount of gestures (2.0 times higher) or the amount of co-speech gestures (3.2 times higher). Further analysis of the results from Figure 1 reveals that in both communities people use gestures more often than

utterances. However, this happens more in the rural community than in the urban community (3.5 times vs. 1.2 times). Moreover, we can infer that, on average, almost each utterance in the rural community is accompanied by a co-speech gesture, while in the urban community every other utterance is accompanied by a co-speech gesture.

These findings demonstrate that in the rural community relatively many social interactions with infants are non-verbal interactions. For instance, mothers may massage the infant's body, feed the infant or point to an object without talking. However, when the rural infant is addressed verbally, a gesture usually accompanies the speech. Urban infants are talked to much more frequently, but only half of the utterances addressed to them are accompanied by a gesture. In addition, although the link between speech and gesture appears less strong in the urban community, the absolute amount of child-directed gestural input for urban infants is much larger than for rural infants. Thus, the urban community, indeed, provides a richer language environment for the young than the rural communities do (Keller, 2012; LeVine et al., 1996).

The reason for this difference may well be due to the needs that different lifestyles demand of children when they grow older (Keller, 2012). In the rural community there is more need for children to help in the field or in the household, whereas the urban community value educational prospects for their children. However, other factors may contribute to these differences as well. For instance, there is a small difference regarding the educational levels that mothers obtained, so SES is likely to be a factor (Hart & Risley, 1995; Rowe & Goldin-Meadow, 2009). Also, due to globalization, the urban community may have adopted a more Western-like child-oriented socialization pattern (Schieffelin & Ochs, 1989). Furthermore, there is the possibility that mothers in the rural area are less socially attached to their children until a certain age, either because of the high child mortality rates or because of cultural beliefs. Results from interviews we held indicate that in the rural area many mothers do not consider their child part of the community until well past their first birthday, while in the urban area most mothers considered their child a community member at birth or at least before they reach 6-months (Mastin & Vogt, 2013). Of course, additional issues such as health may play a role, and most likely a combination of factors explains why urban infants are exposed to more speech and gestures. Further research is required to understand why there is so much less child-directed speech in the rural community than in the urban.

Although on average the urban community do not gesture with each utterance, the amount of co-speech gestures correlates strongly to vocabulary size at 1;5. Moreover, the amount of utterances addressed to infants in the urban community reveals significant correlations to vocabulary both at 1;5 and 2;1. So, these findings correspond well to results from earlier research in Western cultures (Hart & Risley, 1995; Iverson et al., 1999; Rowe & Goldin-Meadow, 2009). However, the amounts of speech and gesture do not correlate to vocabulary development in the rural area, which contradicts these previous studies and is hard to explain.

One possible explanation is as follows: a yet unpublished analysis of the amount of social interactions infants engage in with different communication partners reveals that the amount of interactions with mothers is stable over time during infants' second year of life in the urban community. In the rural community, however, the amount of mother-infant interactions reduces substantially between 1;1 and 1;5, while interactions with siblings increase by approximately the same amount, and which come to equal those of caregivers in frequency by the age of 2;1. Thus, rural infants need to adapt more to changing caregiving structures than urban infants do, with the consequence that the rural socialization structure at 1;1 is neither the same as the socialization structure at 1;5 nor at 2;1. The amounts of speech and gestures at 1;1 may therefore not be viable predictors for vocabulary development in the rural area. Analysis of speech and gesture use at 1;5 and 2;1 should shed new light on this issue. If the interpretation provided here is correct, we expect that co-speech gesture use at 1;5 in the rural community to be a better predictor for vocabulary size at 2;1 than its use at 1;1.

The results from the scores on the vocabulary checklist (Table 3) suggest a difference in the development of vocabulary in both communities. Despite the absence of a correlation between input and vocabulary in the rural community, the most likely candidate for this difference is indeed the difference in the amounts of speech, and consequently the amount of co-speech gestures, that infants are exposed to (Hart & Risley, 1995; Pan et al., 2005). However, Harkness (1977) observed in rural Kenya that children spending more time with adult caregivers tend to talk more and become linguistically more advanced than children who spend more time with sibling caregivers. So, the differences in the socialization structure may be another candidate. A deeper analysis of who infants socialize with more frequently over time and how this relates to vocabulary development should provide new insights into the role of different caregivers on the infants' word learning processes.

The data presented in this paper are being annotated to develop corpora of multimodal interactions between infants and their social environment that can be incorporated in computer models (Matusevych, Alishahi, & Vogt, 2013; Vogt & Mastin, 2013). Using these corpora, we aim to mimic the observed interactions between infants and their surroundings as realistically as possible in multi-agent simulations. With such simulations, we plan to investigate various socio-cognitive theories explaining language development using realistic scenarios in which agents interact socially using speech and gestures according to observed frequencies, and measure the vocabulary

development of the simulated children. One possible application of such a simulation could be to analyze the socio-cognitive mechanisms that underlie the findings from this paper. The envisioned approach will thus provide novel avenues to study cultural and social aspects of multimodal interactions in children's language acquisition computationally in a verifiable manner.

To conclude, we have observed that rural infants are much less exposed to child-directed speech and child-directed co-speech gestures than urban infants, which correlates to their vocabulary development over their second year of life. These findings are in line with predictions based on Keller's (2012) distinction between rural and urban communities. These differences seem to affect vocabulary development as well, but while the results from the urban area are consistent with predictions from western studies (Hart & Risley, 1995; Pan et al., 2005; Rowe & Goldin-Meadow, 2009), those from the rural community are inconsistent. More fine-grained analyses of the data are undertaken to investigate these differences. In addition, we are currently analyzing data collected from middle class urban families in the Netherlands to carry out a comparative study involving all three prototypical communities proposed by Keller (2012).

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References

Bakeman, R., & Adamson, L. B. (1984). Coordinating attention to people and objects in mother-infant and peer-infant interaction. *Child Development*, 1278-1289.

Bornstein, M. H., & Putnick, D. L. (2012). Cognitive and socioemotional caregiving in developing countries. *Child Development, 83*(1), 46-61.

Brown, P. (2011). The Cultural Organization of Attention. In A. Duranti, E. Ochs & B. Schieffelin (Eds.), *The Handbook of Language Socialization*: Blackwell Publishing Ltd.

Carpenter, M., Nagell, K., Tomasello, M., Butterworth, G., & Moore, C. (1998). Social Cognition, Joint Attention, and Communicative Competence from 9 to 15 Months of Age. *Monographs of the Society for Research in Child Development, 63*(4).

Fenson, L., Pethick, S., Renda, C., Cox, J. L., Dale, P. S., & Reznick, J. S. (2000). Short-form versions of the MacArthur communicative development inventories. *Applied Psycholinguistics, 21*(1), 95-116.

Harkness, S. (1977). Aspects of social environment and first language acquisition in rural Africa. *Talking to children: Language input and acquisition*, 309-316.

Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*: Paul H Brookes Publishing.

Iverson, J. M., Capirci, O., Longobardi, E., & Caselli, C. M. (1999). Gesturing in mother-child interactions. *Cognitive Development, 14*(1), 57-75.

Keller, H. (2012). Autonomy and relatedness revisited: Cultural manifestations of universal human needs. *Child Development Perspectives*.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 159-174.

LeVine, R. A., LeVine, S., Dixon, S., Richman, A., Leiderman, P. H., Keefer, C. H., & Brazelton, T. B. (1996). *Child care and culture: Lessons from Africa*: Cambridge University Press.

Lieven, E. V. M. (1994). Crosslinguistic and crosscultural aspects of language addressed to children. In C. Gallaway & B. J. Richards (Eds.), *Input and interaction in language acquisition*. Cambridge: Cambridge University Press.

Mastin, J. D., & Vogt, P. (2013). Correlations between infant engagement levels and vocabulary development: An observational study of Mozambican infants from 1;1 to 2;1. *Under review*.

Matusevych, Y., Alishahi, A., & Vogt, P. (2013). Automatic generation of naturalistic child–adult interaction data *CogSci 2013*.

McNeill, D. (1985). So you think gestures are nonverbal. *Psychological Review, 92*(3), 350-371.

Pan, B. A., Rowe, M. L., Singer, J. D., & Snow, C. E. (2005). Maternal correlates of growth in toddler vocabulary production in low income families. *Child Development, 76*(4), 763-782.

Rowe, M. L., & Goldin-Meadow, S. (2009). Differences in early gesture explain SES disparities in child vocabulary size at school entry. *Science, 323*(5916), 951.

Schieffelin, B., & Ochs, E. (1989). *Language socialization across cultures*. Cambridge, UK.: Cambridge University Press.

Vogt, P., & Mastin, J. D. (2013). Anchoring social symbol grounding in children's interactions. *Künstliche Intelligenz, 27*(2), 145-151.

Zukow-Goldring, P. (1996). Sensitive caregiving fosters the comprehension of speech: When gestures speak louder than words. *Early development and parenting, 5*(4), 195-211.