MATERNAL RESPONSEIVESNESS TO CHILDREN WITH HEARING LOSS DURING PLAYTIME VERSUS MEALTIME

by

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ABSTRACT

The purpose of this investigation was to explore whether or not environment affected how mothers of children with hearing loss respond to their child. Specifically, the researchers analyzed extant data from two studies (Lund 2014 and Lund & Schuele 2016) for four behaviors: unrelated responses, directing responses, ambiguous responses, and nonobligatory responses. Each video was coded according to a pre-written manual (Lund, unpublished) and codes were averaged out of the total maternal utterances found. After the videos were coded, a univariate analysis of variance was conducted and of the four criterion that were investigated, three were found to be significant between the two populations. The main effect of directing responses was not significant. The main effect of unrelated responses was significant, higher for mealtime. The main effect of ambiguous and nonobligatory responses was significant, higher for playtime. We also ran a post- hoc analysis to determine if maternal Mean Length of Utterance was significant (it was, higher for playtime). The implication for these findings is that there are missed opportunities for intervention during both playtime and mealtime, which is an oversight of the ultimate goal of generalizing behaviors across conditions so that intervention is maximally effective. It is important to consider these implications in further discovery so as to better use intervention time during a child's normal routine.

Maternal Responsiveness to Children with Hearing Loss During Playtime versus Mealtime

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Background Information

Because communication is transactional (Sameroff, 1975; Sameroff & Fiese, 2000), any examination of communicative behavior must include analysis of at least two communication partners. For successful communication to occur, partners must coordinate their verbal and nonverbal communicative behaviors (Cologon, Wicks, & Salvador, 2016). Thus, evaluation of the communication skills, including language, of a child must also consider the social context of the interaction (Golinkoff, Soderstrom, & Hirsh-Pasek, 2015). Children with hearing loss, even those who receive access to sound relatively early, tend to exhibit delayed spoken language acquisition (e.g., Lund, 2016). To fully understand this delayed acquisition, we must look to the communicative partners of children with hearing loss. The general purpose of this study was to consider the effect of context on maternal input behaviors to children with cochlear implants.

Research regarding early outcomes for children with hearing loss demonstrates that children with hearing loss, on average, have lower language levels as compared to their hearing peers of similar age and socioeconomic status. However, language growth is affected by factors such as early amplification, or in the case of children fit after 18 months, quality of amplification (Tomblin, Barker, & Hubbs, 2007). For children who have been without access to sound, a rapid rate of development, higher than typical, must be accomplished in early life in order to catch up to the language levels of hearing peers. Longitudinally, communication outcomes for school-aged children also show that children with cochlear implants do not score as well as their hearing peers in the areas of literacy, speech and language. However, some factors such as short duration of deafness, female gender, and high performance intelligence quotients were correlated with better performance overall (Geers & Sedey, 2011).

More than 90% of all deaf children are born into a family with two hearing parents and more than 95% of all deaf children are born to a family with at least one hearing parent (Mitchell & Karchmer, 2004). In some cases, the unforeseen nature of hearing loss leads hearing parents of deaf children to believe that hearing loss is medical in etiology, thus adopt a mentality that hearing loss can and should be cured (Knoors & Marschark, p.54). Parental decisions regarding amplification, treatment, and services further contribute to the family profile of children with cochlear implants. Parental levels of stress between parents of toddlers with hearing loss compared to levels of parental stress of parents with hearing toddlers are comparable. However, child factors such as poor social-emotional functioning poor child language ability resulted in higher stress levels in parents. Further, parents who experience less support socially also reported higher levels of stress (Dirks et al., 2016).

Many children with cochlear implants will have age-appropriate nonverbal skills, even though they lack linguistic knowledge (Geers et al., 2003). The results suggest that a child who is 3-years-old may have the language skills of an 18-month-old child, presenting potential conflicts for caregivers. For example, caregivers must decide whether they should talk to their child according to his or her chronological age or according to his or her language level. Research demonstrates that mothers of children with cochlear implants change the acoustics of their messages to accommodate low language levels: these mothers still provide auditory features of infant-directed speech such as variable prosody, emphasized juncture and widely varying intonation to older children (Bergeson et al. 2006; Kondaurova and Bergeson 2011). This implies that mothers have an awareness of the need to change features of their language to accommodate their child's linguistic and hearing needs by talking to them at their linguistic level, which does not match their age. However, other features of maternal communicative input match children's

chronological ages. For example, mothers of children with cochlear implants coordinate gesture and speech similarly to mothers of children normal hearing of the same chronological age. The finding also demonstrates that mothers of children with cochlear implants do not coordinate their gesture and speech to the level of mothers of children with the same language level, who would be younger chronologically (Lund & Schuele, 2015). Clearly, there are components of maternal input that could be a target of intervention to try to improve language outcomes in children with cochlear implants. If mothers can scaffold language by providing appropriate auditory and visual cues, it may be possible to facilitate word-object pairings in word-learning contexts and facilitate lexical growth (Lund & Schuele, 2015).

Children who are hard of hearing benefit from having responsive communicative partners. In a 2013 study, Quittner and colleagues found that maternal sensitivity, which was rated on a scale using the National Institute of Child Health and Human Development's Early Childcare Study, predicted significant increases in the growth of oral language for deaf children who had received cochlear implants. The implication of this study is that high maternal sensitivity elicits language growth and therefore, acknowledging that the behavior of parents is imperative for early language learning after implantation. Similarly, Ambrose and colleagues (2015), determined that mothers who used a high number of directives tended to have children with hearing loss with lower language levels than mothers who used more conversational styles of communication.

It is still unclear whether or not the environment (e.g., home routine or situation) in which parent-child interaction occurs alters the way that mothers respond to their children. Little has been researched about the language opportunity of different environments and whether or not that environment highlights contrasts in maternal responsiveness. Both the Quittner et al., (2013)

and Ambrose et al., (2014) study evaluated mother-child interactions in a play-time and gallery-walk context (wherein mothers pointed out features of pictures to children). Should contrasts in maternal responsiveness be identified across environments, the potential implication is that intervention related to communication style should differentially target environments and routines in the daily life of a child with hearing loss.

The specific purpose of this investigation was to understand how mother-child interactions for children with hearing loss differ across environments. Specifically, the investigators sought to compare maternal responsiveness during playtime and mealtime interactions. The researcher hypothesized that running an analysis of maternal interactions in differing environments would demonstrate that during playtime, parents would demonstrate more difficulty responding to child communications than during mealtime. The hypothesis stems from the assumption that playtime does not necessarily have predictable communicative acts, whereas mealtime does (i.e., the child is probably requesting food when a request is made). Playtime is not restricted to a specific pattern or routine and allows for creative freedom from the child when manipulating objects. Therefore, there are more opportunities to incorrectly judge the intentions of a child and respond with content that is not related to a child's intentions. Secondary to the primary hypothesis, the researcher predicted that directing responses would prove significantly higher for mealtime than for playtime because there is a specific goal for mealtime (i.e., feed the child) whereas in playtime there is not. In order to address the purpose of this study, the following inquiries were proposed:

- Does a significant difference exist between unrelated responses during playtime versus unrelated responses during mealtime?

- Does a significant difference exist between ambiguous responses during playtime versus ambiguous responses during mealtime?
- Does a significant difference exist between nonobligatory responses during playtime versus nonobligatory responses during mealtime?
- Does a significant difference exist between directing utterances during playtime versus directing responses during mealtime?

These questions guided the coding criterion and data synthesis in order to determine the contrast between maternal interactions in multiple environments.

Materials and Methods

Participants

The study evaluated extant data collected by researchers across two other studies. The first study (Lund & Schuele, 2015) included 10 children with cochlear implants and their mothers. Within this study, mother-child interactions were filmed during mealtime at the child's home. Six mother-child dyads from the study were used for the present research. All children are from monolingual English-speaking families who were teaching their child to use listening and spoken language (as compared to sign language). Children with cochlear implants had a sound field threshold of at least 20 dBHL for 500 through 4000 Hz, all had a hearing loss identified at birth, and age of first cochlear implantation ranged from 16 to 43 months, with an average of 23 months. Participants had no additional diagnosis beyond hearing loss and were each enrolled in speech-language therapy services. Further, each had an expressive vocabulary of fewer than 50 words.

Data from the second study comes from an additional study of mother-child interactions during playtime (Lund, under review). Six mother-child dyads were filmed during playtime in a

research laboratory setting. All participants met the same criteria of language use listed above (e.g., fewer than 50 expressive words). All children had amplification from either cochlear implants or hearing aids with functional aided thresholds of at least 20 dBHL for 500 through 4000 Hz with the exception of one dyad, who demonstrated aided responses at 50dB in the 2000-6000 Hz range. Age of identification ranged from birth to 18 months and range of amplification ranged from 2-23 months. The six mother-child dyads from each study were selected from their larger pool and matched to a dyad in the other group. Children were matched for quantity of expressive vocabulary knowledge as recorded on the MacArthur Bates Communicative Development Inventory (Fenson et al., 2004) in each study.

Procedure

The researchers evaluated two videos from each mother-child dyad. Half of the videos were of mealtime interactions and the other half were playtime interactions. Each mealtime video ranged from 7 minutes to 30 minutes and all playtime videos ranged from 10 to 11 minutes. During the mealtime videos, the researchers recorded a routine feeding, but set out novel kitchen items in front of the child to interact with. Dyads from the playtime videos were randomly assigned a play set (blocks, plastic pizza, shaving cream, doll and ironing kits) and were given unstructured time to play.

The transcription process began by orthographically transcribing maternal utterances and any intelligible child utterances using the Systematic Analysis of Language Transcripts conventions (SALT; Miller & Iglesias 2008). Researchers tracked the transcripts in conjunction with the videos, adding codes according to the following criteria. Each video was coded for all responses to child communication attempts according to the coding manual entitled: *Maternal Contingent Communicative Responsiveness with Children with Cochlear Implants* (Lund,

unpublished). The manual was created based on coding procedures used in studies of children with normal hearing (e.g. Gogate et al. 2000). Specifically, each video was coded for unrelated responses, ambiguous responses, nonobligatory responses and directing responses. Each sub-category of responses allowed the type of response to be categorized according to its unique features. The first sub-category, unrelated responses, are defined as occurring when "the child has directed a communication act with clear intent at the mother that the mother clearly ignored. The mother may ignore the act by not responding or by changing the topic" (Lund, unpublished). The second, ambiguous responses were coded "when the child has directed a communicative act toward the mother, but the communicative purpose is unclear" (Lund, unpublished). This code is used in lieu of the unrelated code if the mother does not attempt to clarify the act, but instead ignores it or changes the topic. The third code related to ignoring responses is the nonobligatory response, which is characterized "when a child has not necessarily directed a communicative act toward the mother, but the mother changes topic or brings up a topic of communication that is completely unrelated to the most recent/ previous episode of communication" (Lund, unpublished).

In addition, the videos were coded for directing responses. Directing responses are not categorized under the theme of ignoring responses. Directing responses are made by the mother to manipulate a child's behavior and under the directive response, the child does not have a choice but to follow the directing response. For example, regulatory remarks such as "don't eat that" or "grab that toy" would be considered directing responses. Directing responses do not include commanding language that indicate 'showing' or 'commenting' phrases such as "look at this."

After all videos were coded, the SALT program was used to count number of codes across each transcript. The frequency data was then used to create a percentage of frequency of the given code in relation to the total number of maternal utterances to account for the differing lengths of the videos. Creating a percentage of codes per maternal mean length of utterance also accounts for the differences in how much each mom talked across the study. After a qualitative count of the codes were acquired, univariate analysis of variance was used to determine if there was a significant difference ($p \leq .05$) between the percent of the coded variable across environments.

Table 1. Types of responses coded

Cue Code	Abbreviation	Specific Behavior	Example
Unrelated	Unr	A communication act with clear intention by child is ignored mom changes topic	Child points at toy out of reach, vocalizes and makes eye contact, mom does not hand child the toy or comments on different toy
Ambiguous	Unramb	A communication act with unclear intention by child is ignored or mom changes topic	Child vocalizes at random and mom does not attempt to clarify the act or offers a toy assuming that the child wanted it.
Nonobligatory	Unrnobl	A child does not make a communication attempt and mom makes an unrelated topic shift	Mom begins talking about doing laundry at home while the child is playing with the pizza play set
Directing	Dir	Mom uses command to manipulate child's behavior	Mom tells the child to take a bite of food

Results

A univariate analysis of variance was used to consider the effect of environment (playtime vs. mealtime) on four dependent variables. The first research question asked if a significant difference exists between unrelated responses during playtime versus unrelated responses during mealtime. For the percent of unrelated utterances, mealtime and playtime were compared and the main effect of the environment was significant. The results of the unrelated utterances indicated that mealtime yielded more unrelated responses ($\overline{x}$=0.75, δ=1.48) as compared to unrelated responses during playtime ($\overline{x}$=3.12, δ=2.37) $F(1,22)=7.001$, $p=.015$.

The second research question asked if a significant difference exists between ambiguous responses during playtime versus ambiguous responses during mealtime. For the percent of unrelated ambiguous responses, mealtime and playtime were compared and the main effect of the environment was significant, yielding a higher average for playtime ($\overline{x}$=5.42, δ=3.06) as compared to mealtime ($\overline{x}$=2.67, δ=4.29) $F(1,22)=12.165$, p=.002.

The third research question asked if significant difference exists between nonobligatory responses during playtime versus nonobligatory responses during mealtime. For the percent of unrelated nonobligatory responses, mealtime and playtime were compared and the main effect of the environment was significant, yielding a higher average for playtime ($\overline{x}$=6.25, δ=3.63) as compared to mealtime ($\overline{x}$=5.25, δ=6.69) $F(1,22)=5.850$, p=.024.

The final research question asked if a significant difference exists between directing utterances during playtime versus directing responses during mealtime. For the percent of directing responses, mealtime versus playtime was compared and the main effect of the environment was not significant $F(1,22)=1.73$, p=.202.

The researchers also conducted a post-hoc analysis of maternal mean length of utterance to see if there was a significant difference across environments. For maternal MLU, the effect of environment was significant, yielding higher results for playtime ($\overline{x}$=4.32, δ=1.09) than mealtime ($\overline{x}$=3.51, δ=.57).

Discussion

The purpose of this study was to determine if interactions between mothers and their children with hearing loss differed with consideration of the environment in which they interacted. The results of the study demonstrated that in the case of all three subcategories of ignoring responses (unrelated, ambiguous, nonobligatory), the main effect of the environment

was significant. However, the three unrelated responses did not homogenously favor one environment over another. Rather, unrelated responses were significantly higher for mealtime interactions, whereas ambiguous and nonobligatory responses were significantly higher for playtime interactions. The implication of these results is that during mealtime children make more communication attempts with a clear intention which are, in turn, frequently ignored by their mother. Mealtime is inherently more structured than playtime, with the ultimate goal of feeding the child through routine processes. In contrast, ambiguous and nonobligatory responses yielded results favoring playtime interactions. This finding indicates that in the case of playtime, children were more likely to make unclear communication attempts or not make an attempt at all, followed by a maternal topic shift or no attempt to truly clarify the act. This was not surprising because playtime by nature is less clear in direction and content than mealtime. A noteworthy point to consider is that the children in the playtime video were not in their home environment, whereas they were at home in the mealtime study. Therefore, accounting for the ambiguity of the toys and/or the environment of the child becomes more complicated. Also, it is possible that the children of the playtime study and the mealtime study could have differing capacities for pretend play and therefore, some children were better able to create and follow scenarios for play than others. Thus, some children may have differentiated abilities to create play out of the toys during the playtime interaction as opposed to the mealtime interactions.

Although the main effect of the environment was significant for all three ignoring responses, the main effect of environment was not significant for directing responses. This result refutes the earlier hypothesis that more directing responses would exist during mealtime. Qualitatively, the play sets were such that there was generous opportunity to give direct responses. For example, the household ironing set allowed for play sequencing of ironing,

folding and putting away the clothes, during which mom could direct the child to mimic the way the chore would be carried out at home. In reference to the pool of the play sets, there were opportunities in each for mom to request that the child manipulate, open, or use objects so that the child was using play objects in a meaningful way. Hence, generous opportunity for directing responses were available.

As an added measure of interest, the researchers also coded two paternal playtime videos. The father-child interactions were coded using the same coding manual *Maternal Contingent Communicative Responsiveness with Children with Cochlear Implants* (Lund, unpublished). The data from the dad videos showed that directing responses met or exceeded the highest percentage of maternal directing responses (at or above 15%). In comparison to the mother-child data, the total number of paternal utterances fell at or below the bottom 25% of total maternal utterances in the 10-minute play samples. With regard to unrelated responses, ambiguous responses and nonobligatory responses, the paternal data showed that father-child interactions fell within the range of percentage of the mother-child interactions that were ambiguous or nonobligatory. Therefore, even though father-child interactions tended to involve less overall language, the way in which they were responding to their child was similar to mother-child interactions. However, the two dads tended to drive the action of the play sessions with more directive language. The difference that we see could be attributed to several factors, including the play sets that they were using. Further, the two children in the paternal videos differed in gender and in age. It is also possible that the differences between all of the mothers as a group and only two fathers reflected characteristics of children, rather than a paternal/maternal difference. For instance, the child with the lowest number of father-child total utterances was also the child with the lowest number of mother-child total utterances.

The findings of this analysis provide a first step towards improving maternal responsiveness to children with hearing loss. First, it is important to note that playtime interactions, in which mothers give their undivided attention to children, are not common among all types of families of varying socioeconomic status (Hart & Risley 1975). The effects of maternal education and occupation are better controlled in a clinic, but inevitably change once families are playing in their home environment. As it stands, playtime presents a missed opportunity for mothers to attempt to better clarify the communication acts of their child and practice intentional follow-in behavior. Further, it also presents a missed opportunity to reduce maternal ignoring and topic-shift behaviors. It is important to question whether or not the maternal tendency to spontaneously topic-shift when the child does not make a communication attempt has an effect on that child's capacity to learn language and develop playtime skills. This speculation is further complicated by the idea that typical play is linked to language skills and playtime milestones that are linked to language (e.g., acting out an imaginative role-playing scenario) could differ when a hearing loss in introduced (Ervin-Tripp 1991).

During mealtime, the number of clear communication acts that are ignored provides an opportunity to further research parent recognition of child communicative attempts. If it is necessary to minimize ignoring behaviors in order to facilitate better language outcomes for children with hearing loss, mealtime presents an open opportunity for intervention. Intervention, however, is challenging because of a family's capability to continually present language input to a child while eating (which the main point of the routine) and participate in intervention when mealtime is rushed or happens as a part of daily obligations. Further, transfer the skills that moms are using during playtime in which they are presenting a longer mean length of utterance

to mealtime responses could increase vocabulary and linguistic complexity for children to expand upon their clear communication acts.

As professionals, the continual pursuit of best practice for intervention warrants further investigation on environmental differences in maternal interaction. The long-term effects of intervention during playtime and mealtime would also bring forth insight as to whether there is truly a need to respond to all acts of communication between mother and child. In continually pursuing research about the effects of environment, it is possible that opportunities for communication intervention can be better incorporated into the daily routines of families with children who have hearing loss.

Figure 1

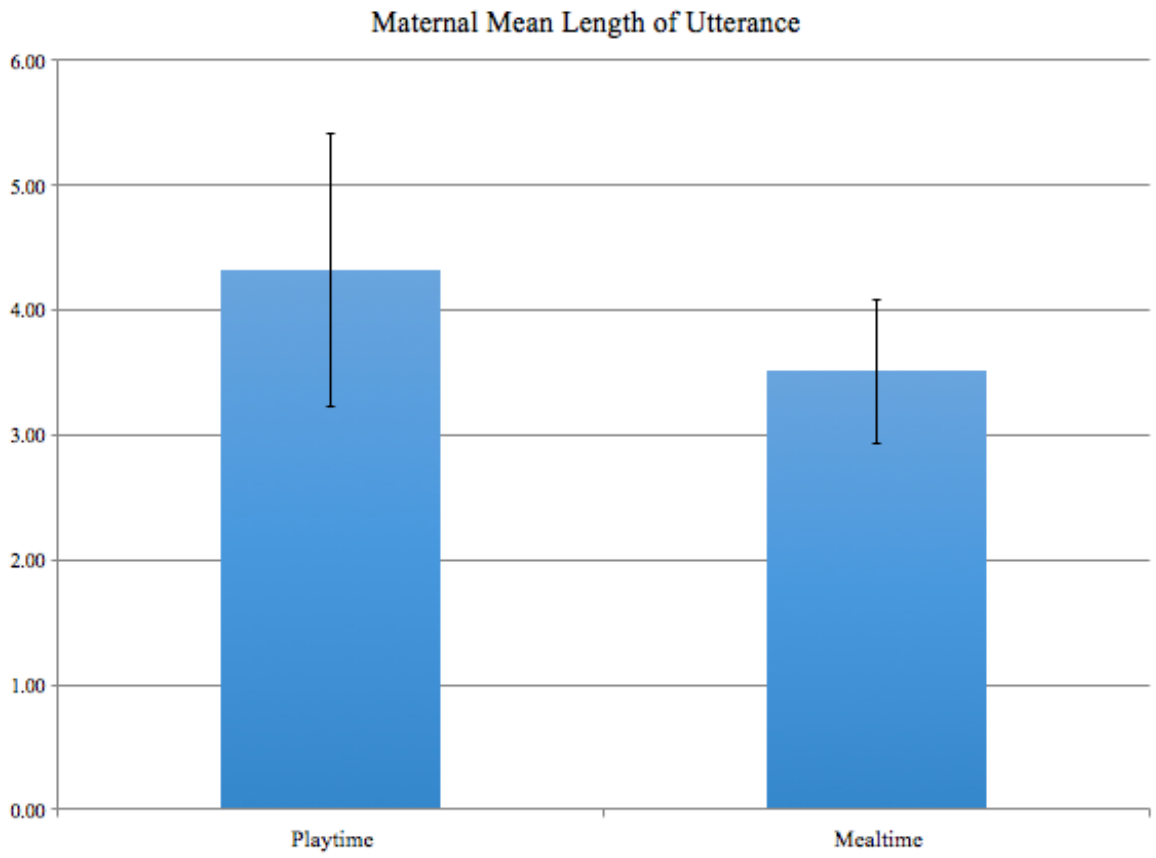
Maternal Mean Length of Utterance
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Playtime
Mealtime

Figure 2

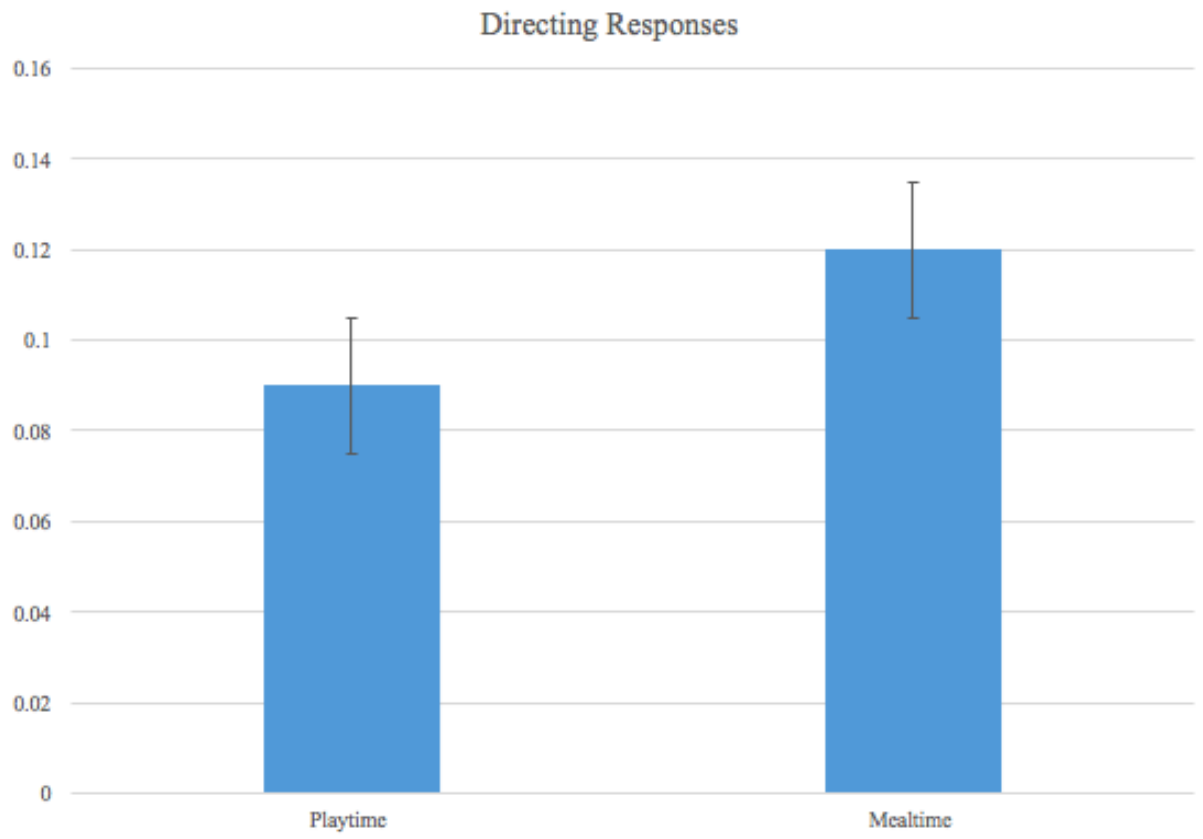
Directing Responses
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Playtime
Mealtime

Figure 3

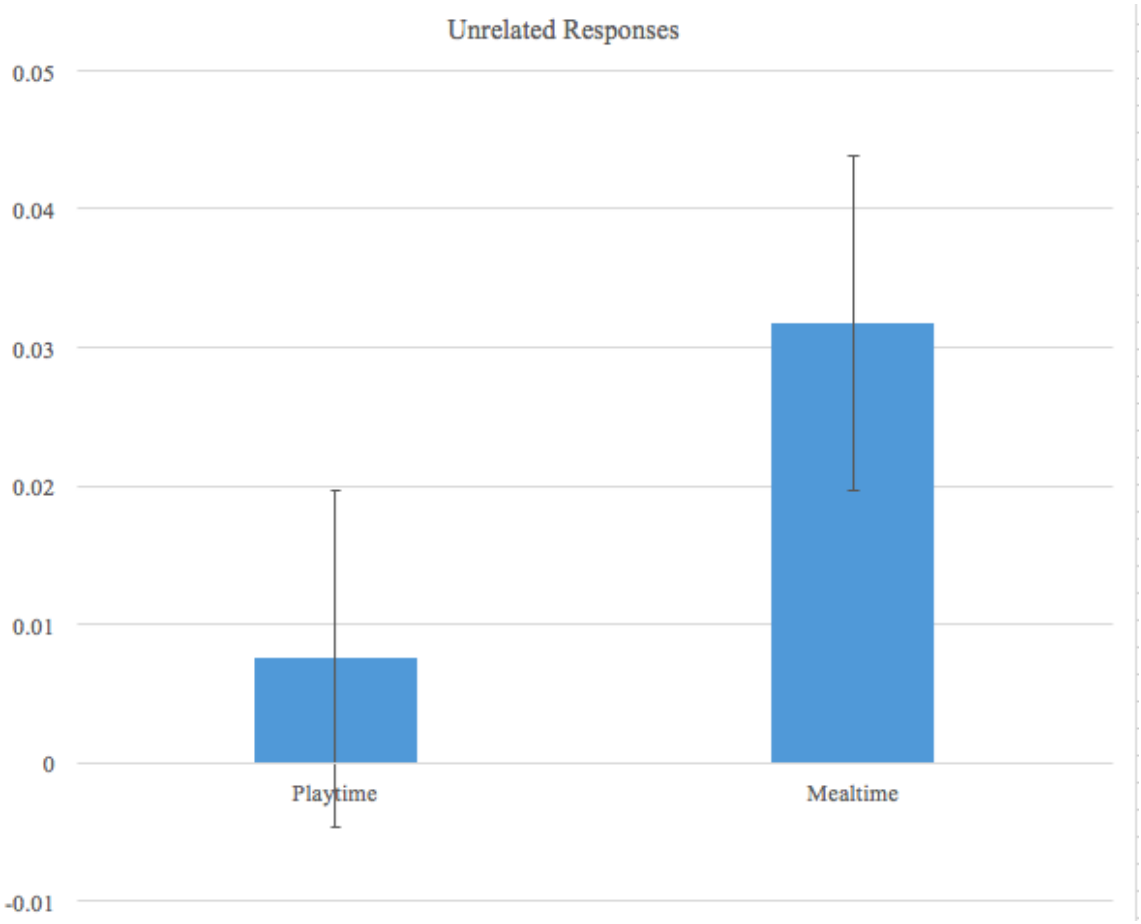
Unrelated Responses
0.05
0.04
0.03
0.02
0.01
0
-0.01
Playtime
Mealtime

Figure 4

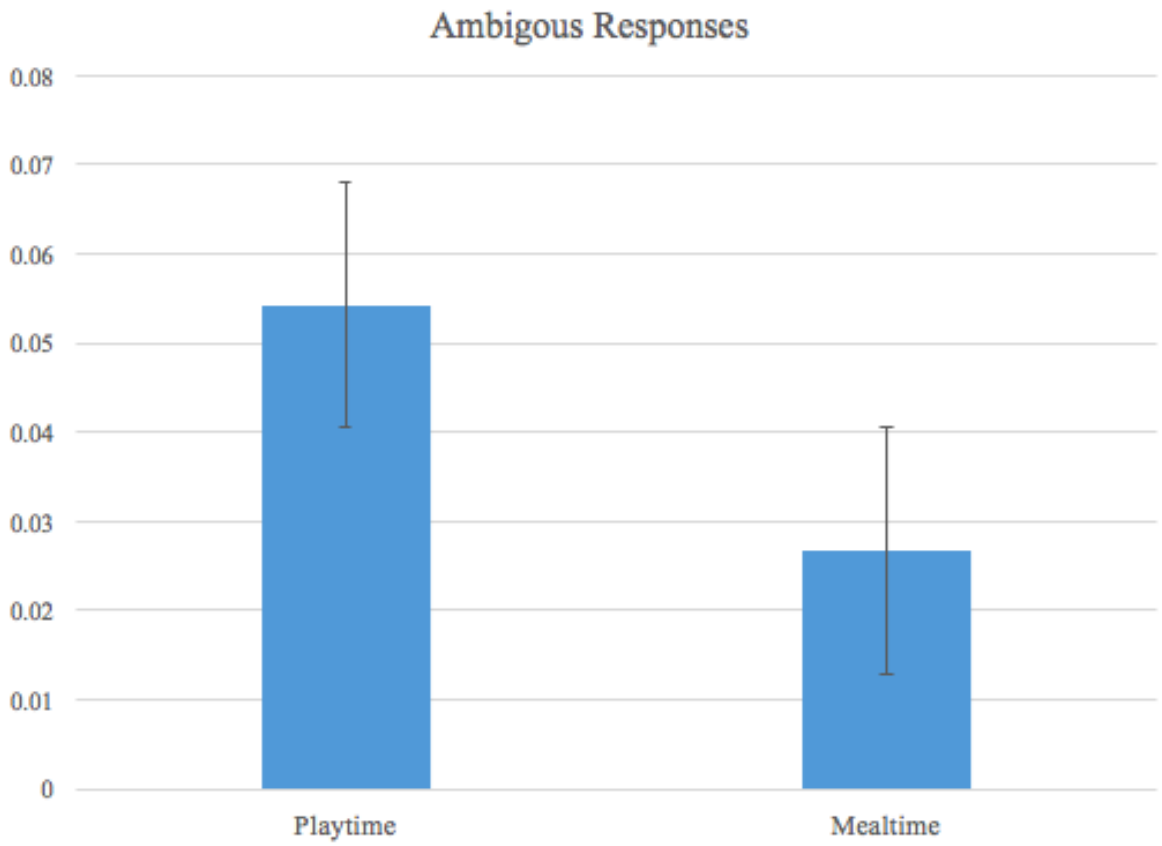
Ambigous Responses
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Playtime
Mealtime

Figure 5

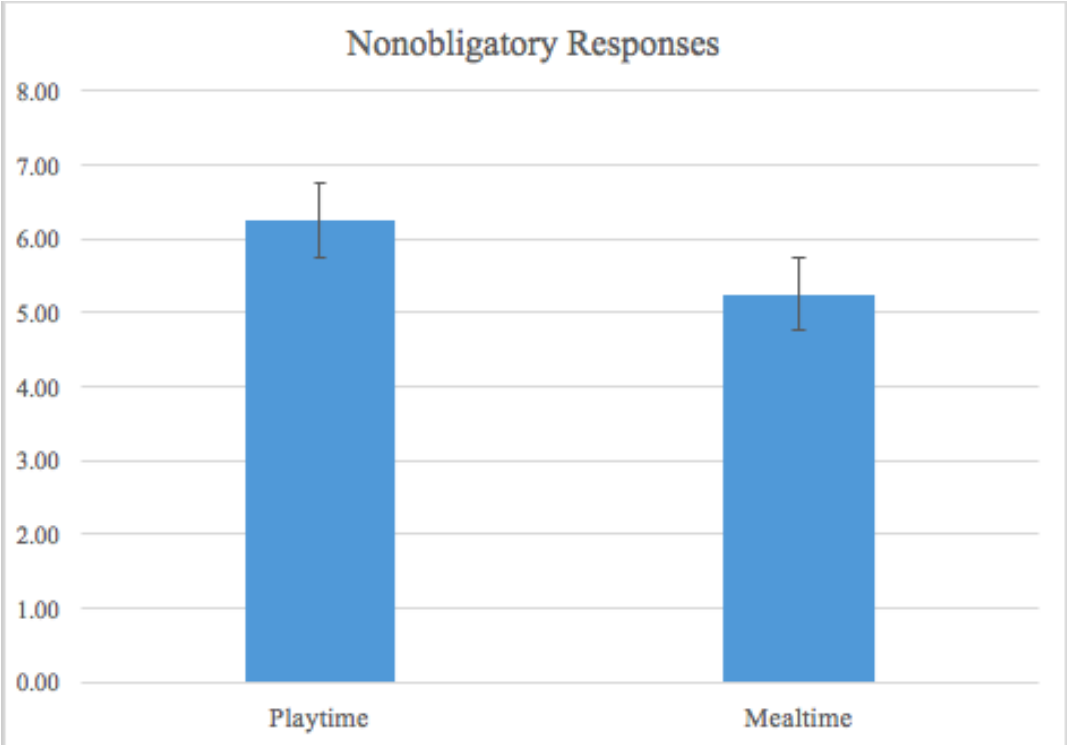
Nonobligatory Responses
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Playtime
Mealtime

Figure 6

Paternal Interactions

Post-hoc analysis

	Total Codes	Directing Responses	Percent Directing	Unrelated Responses	Percent Unrelated	Ambiguous Responses	Percent Ambiguous
Dyad 1	21	15	0.34	0	0	4	0.09
Dyad 2	19	15	0.15	1	0.01	0	0
Average			0.245		0.005		0.0045

	Nonobligatory Responses	Percent Nonobligatory	Duration	Total Paternal Utterances
Dyad 1	2	0.04	10:01	44
Dyad 2	3	0.03	10:21	100
Average		0.035		

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