

## Introduction: Sparse Adult-Infant/Child Interactions in non-Western Cultures

We present an analysis of adult-infant and adult-child interactions between members of the Pirahã tribe, a hunter-gatherer tribe located in Lowland Amazonia, Brazil.

- Adult-infant and adult-child verbal interactions are sparse, and show no specialized prosodic registers, face-to-face interaction with shared reference, simplified lexicon or grammar that have characterized what is commonly called “Motherese”.
- In previous studies of cultures where adults do not appear to converse with their children (e.g., Pye 1983, Ochs & Schefflin, 1984, Heath, 1983), it is noted that there are alternative situations where language teaching occurs, such as directed repetition of phrases. Lieven (1994) has suggested that such routines might constitute an alternative to Motherese as an aid in language learning, and speculates that all cultures might have some form of scaffolding.
- Reports of cultures lacking verbal interactions between adults and infants have tended to be based on informal observations, sometimes backed up with comments from the adult members of the community expressing the general cultural values against talking to children (cf. Heath). We lack any quantitative, objective studies of this kind that focuses on the microstructure of verbal and non-verbal interactions in everyday settings.
- The present study attempts to provide such an analysis based on the coding of a series of videotapes that were recorded by Gordon during two trips to two Pirahã villages in 1991 and 1992. The original videos are available for data-sharing on *databrary*, and this presentation represents the initial results of our analysis of these data.

## Pirahã Culture and Background

The Pirahã have been the subject of considerable interest and controversy in recent years concerning relations between language and culture (Everett, 2005), language and numerical cognition (Gordon, 2004) and lack of recursion in grammar (Everett, 2005). For present purposes, the relevant aspects of Pirahã culture are as follows:

- The Pirahã are a mono-lingual hunter-gatherer society that does not integrate with mainstream Brazilian culture. There are no systems of writing, counting, art, education or formal social hierarchy. Gender roles are very clearly defined involving division of labor (e.g., men make bows and arrows, but women make the string for the bow, weave baskets, make clothes), there are linguistic differences in phonological rules, and there are very strict moral conventions relating to touching women who are married.
- The Pirahã live in small villages of 10-20 persons (adults and children). These are scattered along the Maici river with a total tribal population in the hundreds. Villages consist of 2-3 dwellings which are small open huts with thatched roofs. Food is obtained through hunting using bows and arrows in the jungle, and fishing in the river. Sometimes the Pirahã will develop a clearing near the village and grow manioc root, which is harvested, cooked and eaten.
- The Pirahã language is extremely complex with verb structures that include multiple morphological positions common in Indigenous languages of the Americas.



Left: A Pirahã family in their home (with Dan Everett)  
Right: An elderly woman grooms a young child.



## Procedures

### 1. Data Collection

- Filming was carried out by Peter Gordon during trips to two upriver Pirahã villages led by Dan Everett in 1991 and 1992.
- Filmed sessions recorded on six 2-hour tapes included spontaneous events -- when possible the camera was left on a tripod unattended to capture naturalistic interactions. At times Everett was speaking with villagers, but no data were included if a non-Pirahã person appeared to be directing activities in any way, and videos of numerical cognition experiments (Gordon, 2004) were not coded.

### 2. Video Analysis and Translation

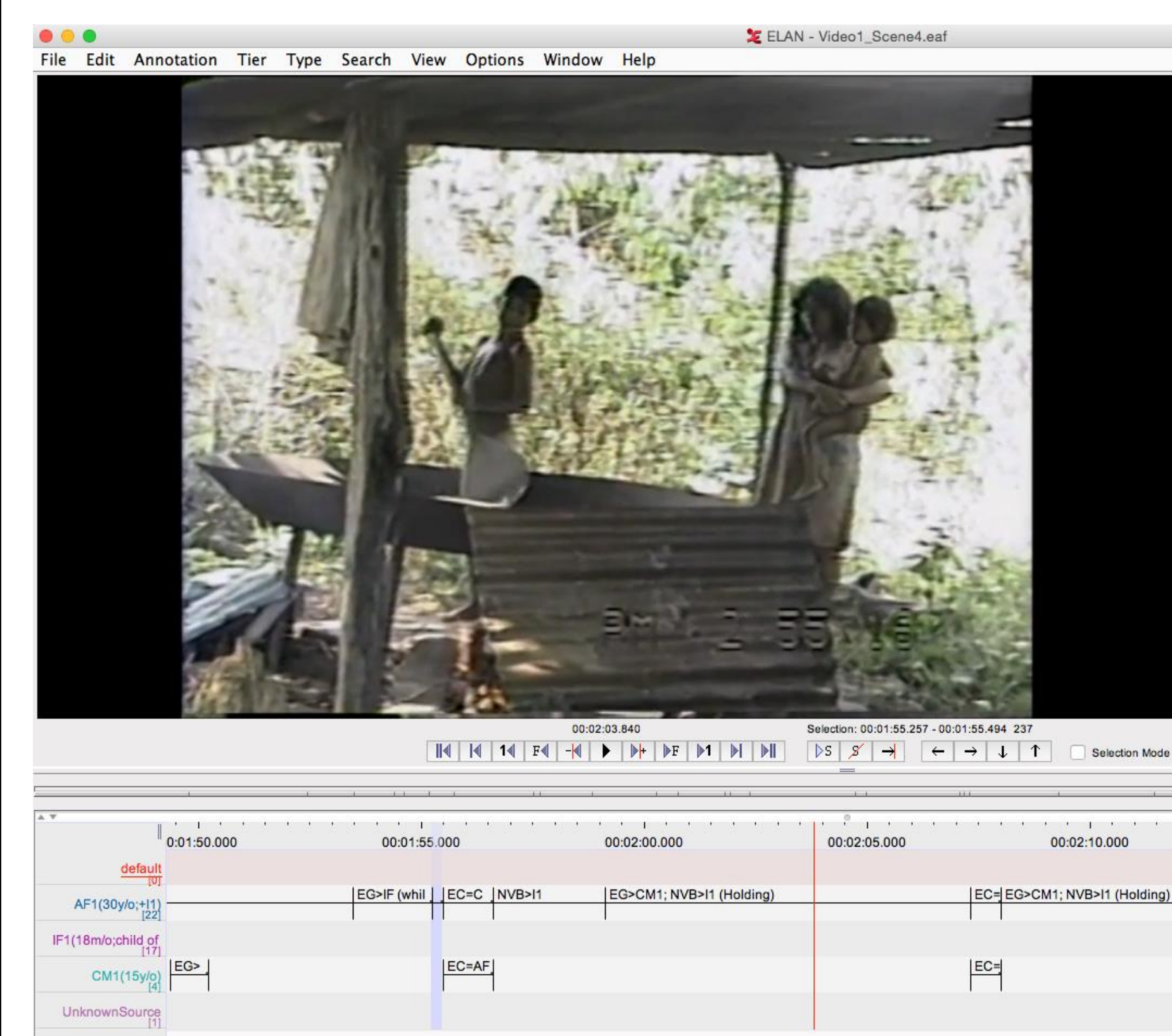
- To systematically analyze adult-infant/child interactions and behaviors of the Pirahã villagers from these films, digitized videos of these films were linked into the ELAN (Eudico Linguistic Annotator) System.
- ELAN is a video/audio analysis software system allowing the generation of distinct coding tiers. This allowed us to annotate each individual's behavioral-linguistic information within the video, as well as interaction patterns.
- Behavioral coding was carried out by the graduate student coauthors
- When verbal interactions appeared to occur between adults and children or infants, Dan Everett was consulted to translate.
- Ambiguous interactions were translated by Everett, with priority placed on verbal interactions. All other ambiguous interactions (target unclear or initiator unclear/off camera) were removed from data set until such time as they could be confirmed.

### 3. Coding System

- The coding scheme that we developed included codes for:
  - Verbal interactions
  - Verbalizations with no target
  - Non-verbal gesturing
  - Non-verbal behavior (e.g., holding, touching, grooming)
  - Eye gaze/contact, crying, laughing, joint attention
- Participants were coded based on gender and age group:
  - Adult (Female/Male)
  - Child (Female/Male)
  - Infant/Toddler
- Since the Pirahã do not count, age was estimated by the behavioral coders, with Gordon and Everett acting as consultants.
- After all behavioral coding has been conducted in the ELAN system, annotation statistics were exported to Microsoft Excel for analysis.

### 4. Measures: Opportunity to Interact (Baseline) vs. Actual Durations of Interaction

- We estimated duration of opportunity to interact, defined as the time that two or more individuals were in close proximity.
- Composition of groups present in video was coded.
- Actual interaction durations (Verbal and non-verbal) were coded as duration of interaction divided by BASELINE.



Screenshot of ELAN coding used to analyze a scene, where a Pirahã adult woman is holding an infant, while a male child takes over cooking duty.

## Results

The videos were initially coded to estimate of overall communication time relative to opportunities baseline. These data (in Figs 1 & 2) reveal that adults spoke more than children, and the Pirahã communicate most frequently within their age group (child-child, adult-adult). Adult-Child verbal communications were vanishingly rare. The following generalizations can also be made based on our observations of the footage in its entirety:

- Adult males tend to speak mostly to other adult males, and associate mostly with adult males and older male children.
- Adult females tend to remain in proximity with other adult females, adolescent females and young children.
- Even when adult women are holding their babies, they almost never make eye contact. In general, Pirahã mothers hold their babies facing out and away from them. They never engage in face-to-face interactions (based on these data and other general observations.)
- There is very little adult conversation directed at children of all ages, despite other physical contact through holding, grooming, or remaining in physical proximity with children.

Figure 1: Minutes of Talking By Age (Adults vs. Children of All Ages)

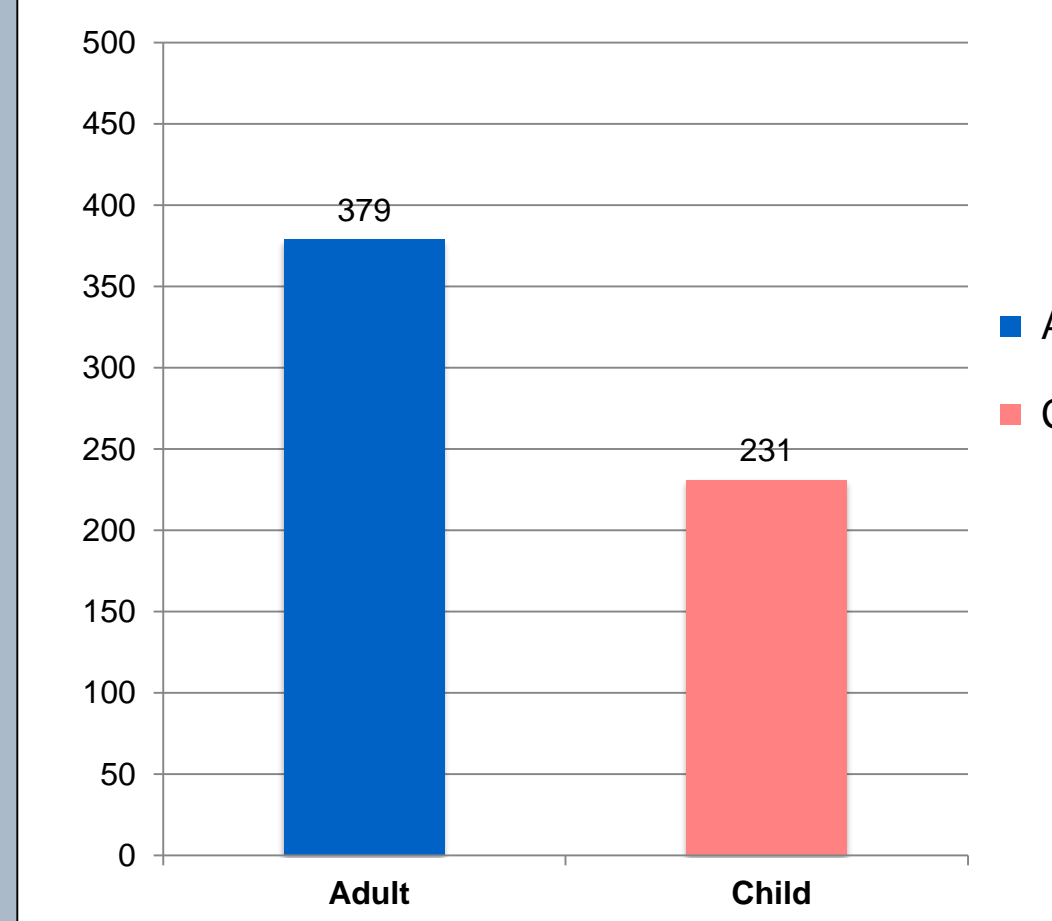
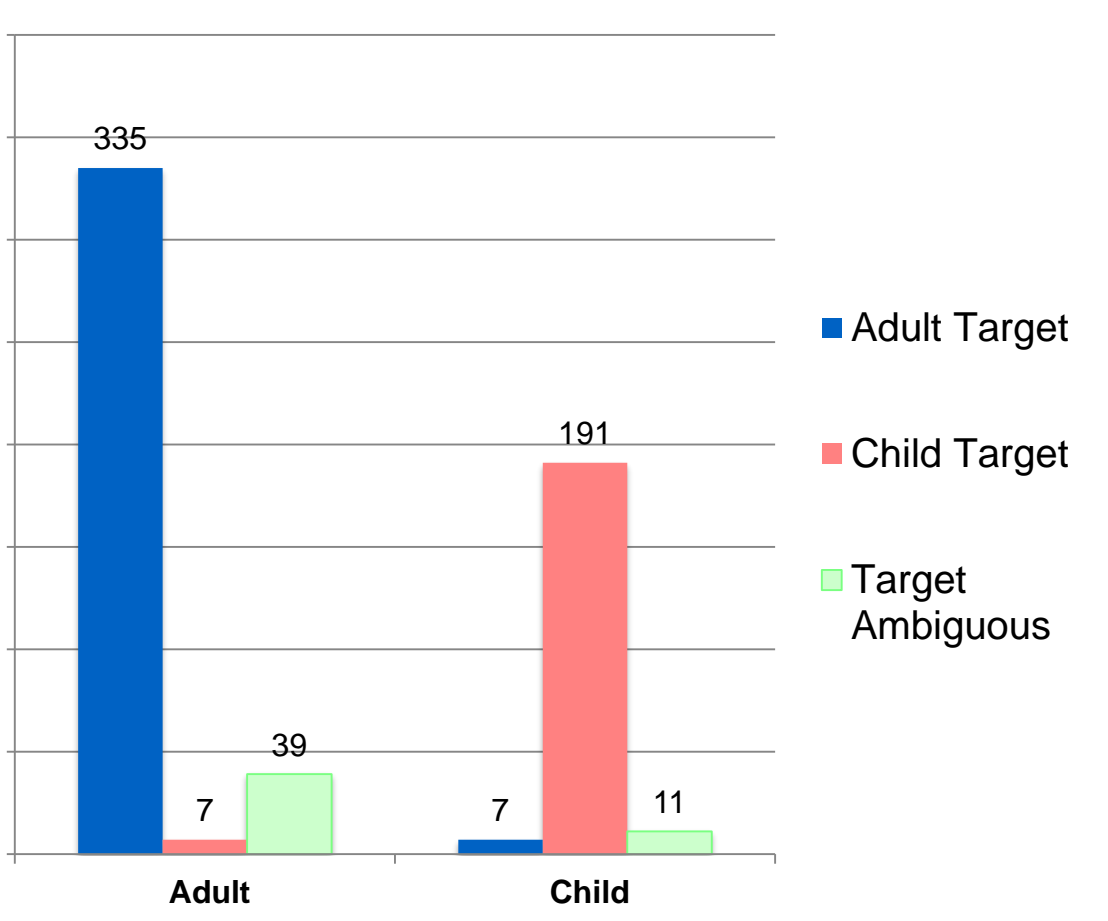
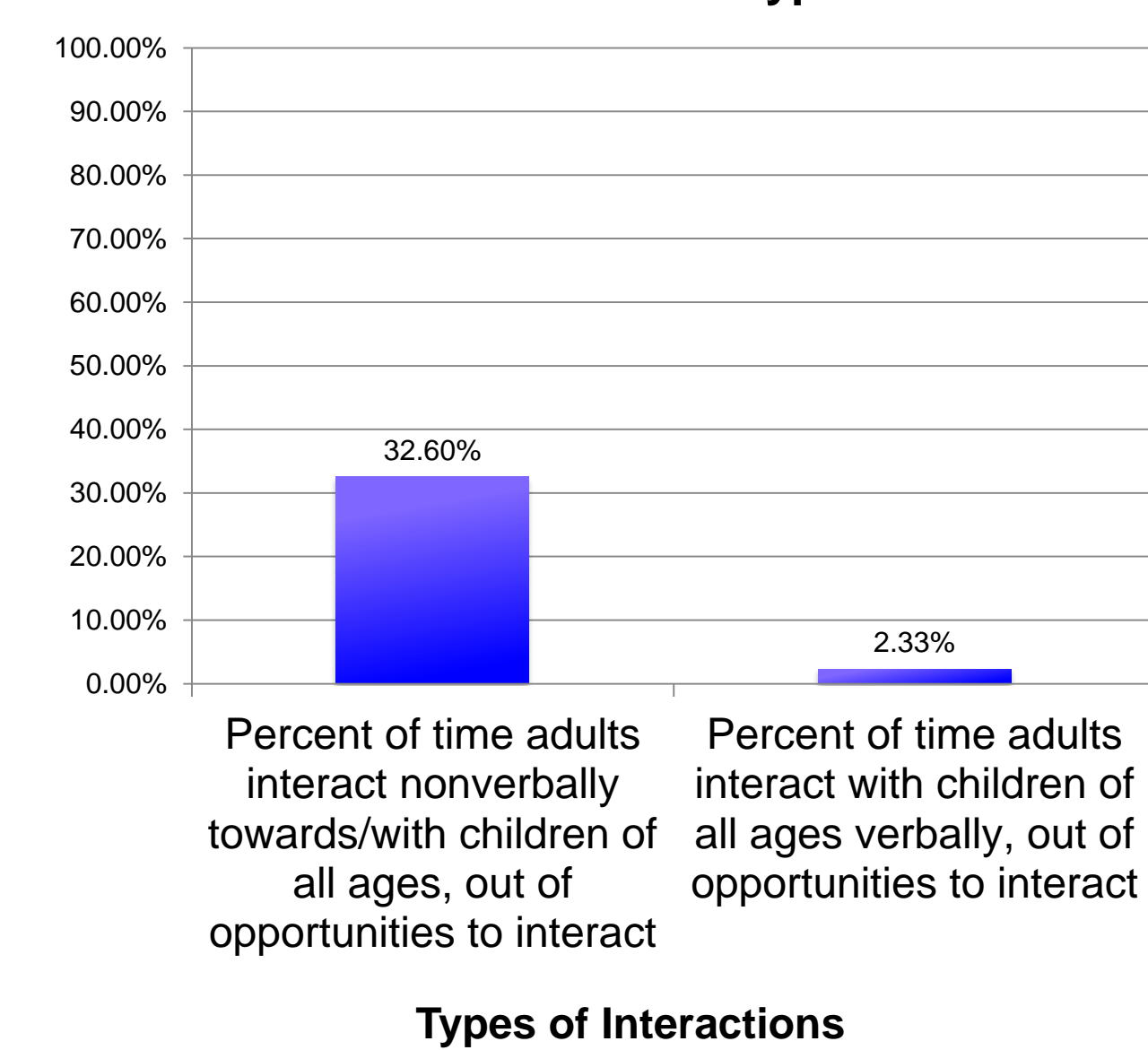


Figure 2: Minutes of Talking (Age of Speaker x Target)



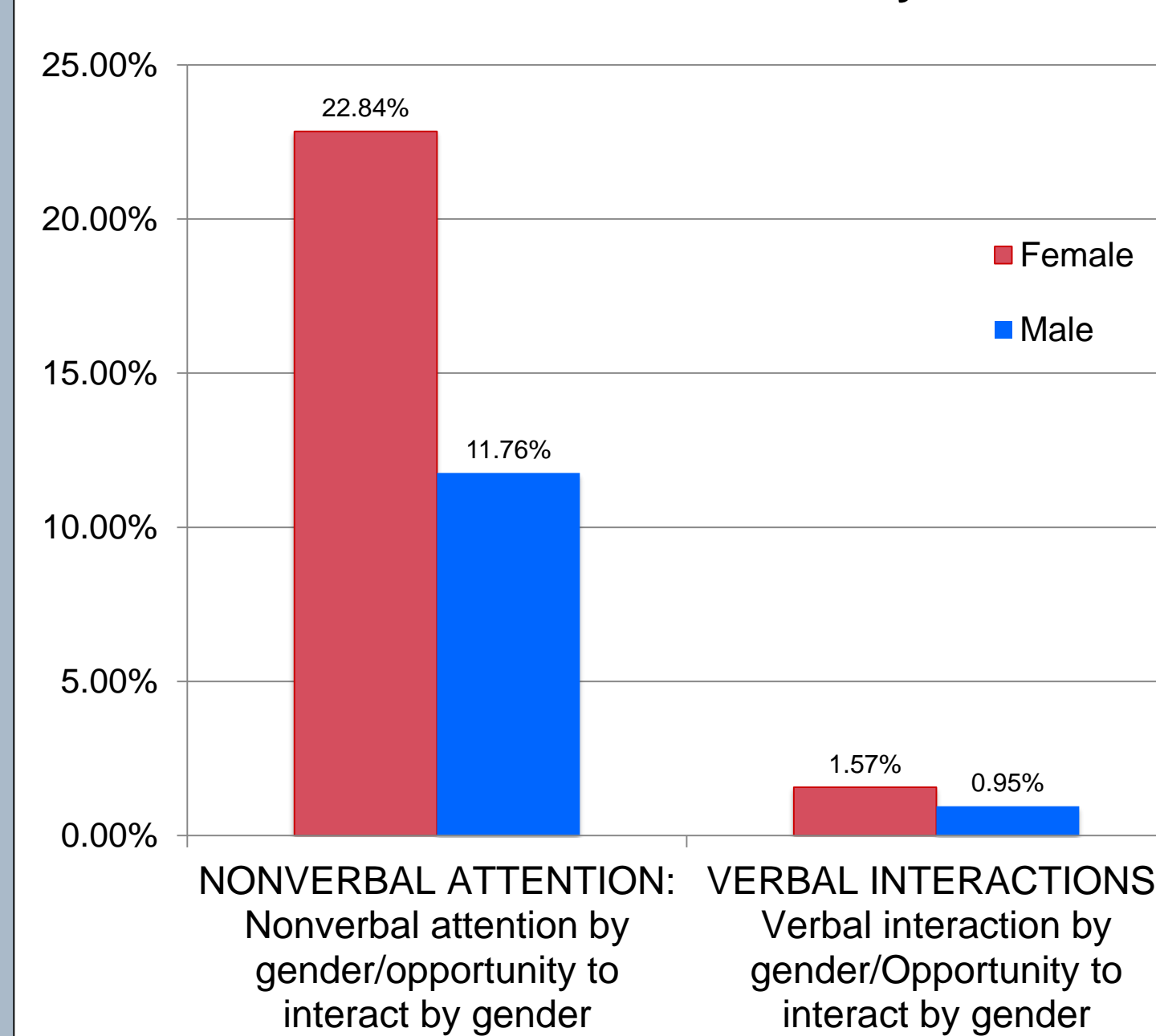
Having analyzed the overall patterns of interaction, we coded specifically for interactions for a select number of scenes that showed clear participation of adults and children. In our preliminary close coding of the data, we selected 11 scenes in which there were adults and children present that engaged in joint activities.

Figure 3: Percentage of Time Adults Interact With Children (of any age) by Interaction Type



The total duration of these scenes was about 12 minutes. During these scenes adults and children were in proximity such that they could interact 98% of the time. Of this, 48.7% of the time consisted of adults and children interacting either verbally or non-verbally. The actual time that adults spent speaking to children of all ages was 2.3%, and time spent talking to infants or toddlers was 1.98% (1.57% for females and 0.9% for males). Non-verbal interactions with children occurred 32% of the time. These data can be found in Figs 3 and 4. Given these scenes were selected for further study based on the high rate of clear adult-child interaction, we expect these figures to decrease some once fine coding is completed for all useable footage.

Figure 4: Adult Nonverbal vs. Verbal Attention to Infants and Toddlers by Gender

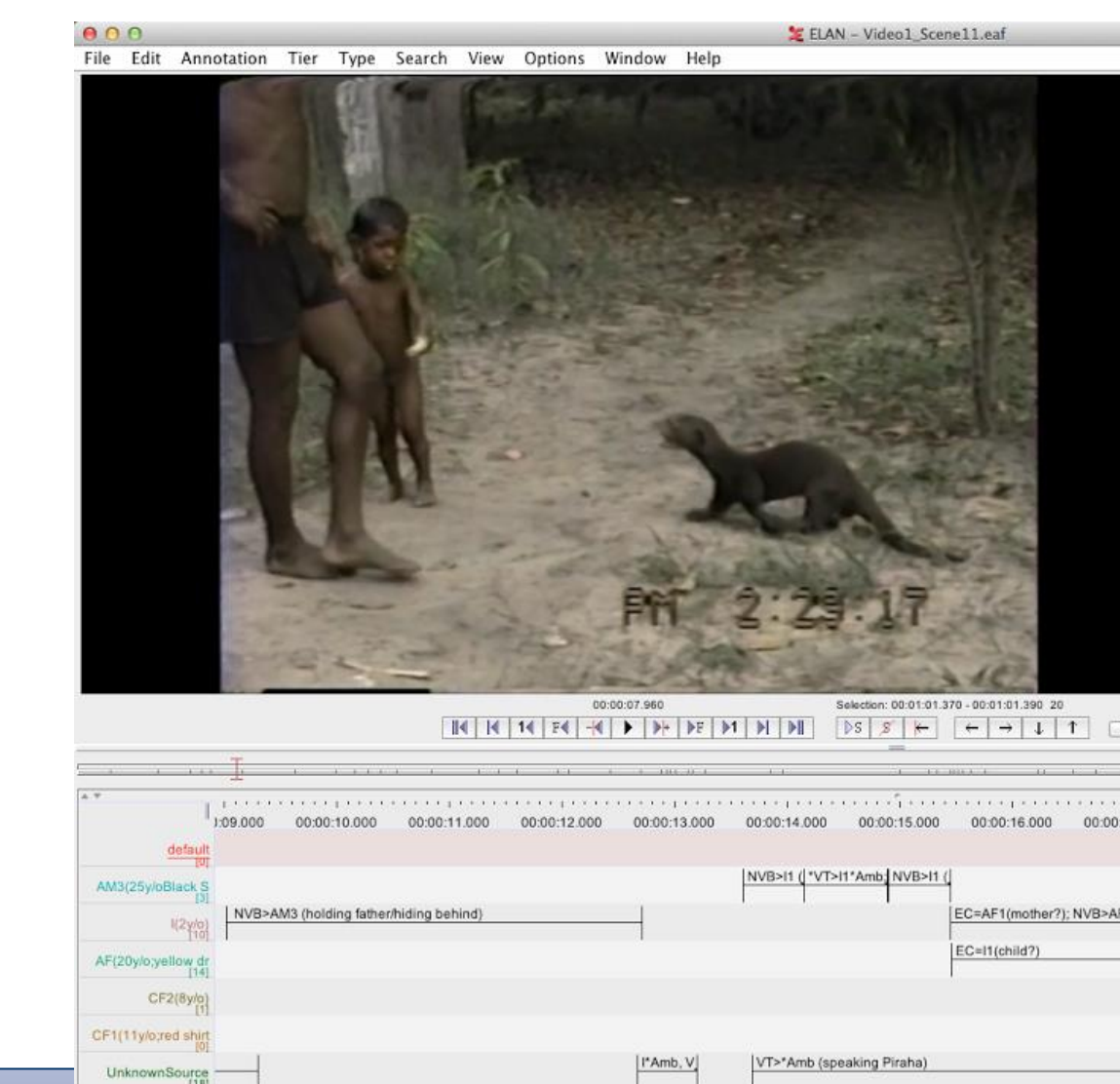


## General Observations

- Our preliminary analyses have confirmed that there are very few interactions between adults and infants in Pirahã daily life.
- There are only 3 cases where there is a clear communication between an adult and infant or toddler. Even in these cases, the utterances are very short consisting of only a word or two, with little eye contact.
- Often there is ambiguity as to whether the adults are, in fact, addressing children or making more general comments to the group.
- Older children engaged in some brief interactions with infants/toddlers, but these also constituted less than 1% of all communication instances.

## Discussion

- Unlike previous cross-cultural studies of sparse language input to infants and children, the present study attempts to quantify the lack of adult-child verbal interaction in a more objective and rigorous fashion.
- We did not find evidence of any ritualized language teaching, nor has such been observed. The only specialized interaction that has been observed elsewhere is the use of “hum speech” that may be soothing to infants, and possibly highlights the tonal structure of the language for them. See:
  - (https://www.youtube.com/watch?v=KYpjFObtV94)
  - In general, we found that there is very little verbal content that is specifically addressed to infants and toddlers who are in the throws of learning language. Interaction is not absolutely zero, but is extremely sparse and is unlikely to be sufficient to fulfill the kinds of teaching roles that are attributed to “Motherese”
- The few incidents we did see involved instructions to wipe the dirt off their nose, or a comment about an object in the situation such as a wheelbarrow or a pet otter. There was no direct face-to-face interaction, no special speech register, and no real focused attention to the infant in particular typical of standard “Motherese”. In addition, when we selected scenes that were rich in opportunities for adults to interact with infants, these were vanishingly rare, constituting only about 1-2% of the total time.
- The present results confirms that there are cultural contexts in which Motherese is absent, and is not substituted by some other language routines. Motherese is not necessary for language learning. Pirahã infants learn language largely by paying attention to the speech of others around them and mapping this to situations that are being picked out by those utterances. How this occurs remains a great mystery.



ELAN Screenshot where a young child is with an adult male observing a pet otter. This elicited brief joking comments and laughter from the adult.

## References

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