Production of the word "Two" in 18-39 Month Olds

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Background

This project studies the development of the word **"two"** in infants as a window into the process through which children develop an understanding of correct **numeric language**. Previous research indicates that acquisition of this number language is both late occurring and cumbersome. Early use of number words is often attributed to a broad understanding of plurality rather than an exact understanding of numbers. However, recent diary studies have documented the correct use of small number words such as "two" by children as soon as they begin speaking. As possibly the first mathematical **symbol** that children learn, the word **"two"** could very well be the jumping off point for children to reason about **numbers**, **sets**, and the property that **numbers can represent sets**. Accordingly, this project takes a detailed look into the acquisition of the word "two".

Current Study

• To follow up previous diary studies and to begin taking a more quantitative look at the acquisition of the word "two", the current study analyzes conversational excerpts of children between the ages of 18 and 39 months.

• Conversations were found on the CHILDES network, the child language component of the TalkBank system for sharing and studying conversation interactions.

• 205 utterances from 51 children have been included in the analysis.

Hypotheses

1.) If children's earliest meaning for the word for two is an **unspecified plural** as previous research suggests, (e.g. Wynn 1992) then **pair meanings** of two **should not** predominate in early speech.

2.) If, on the other hand, children's earliest meaning for the word two is a **pair** then **pair meanings should** predominate in early speech.

Methods

We used CLAN to search various databases on the CHILDES Network for examples of children using the word "two." Excerpts were coded using context and any notes left by the transcriber. Each utterance was placed in one of nine categories.

Example:

```
*** File "katie.cha": line 1121. Keyword:
two
*MOT:and Jimmy ?
*CHI:mmm .
*MOT:joa [//] Jimmy's at school .
*FAT:xxx too young for boy friends to go
xxx
*CHI:there are two Jimmys !
*MOT:yeah .
*MOT:both Jimmys are at home today .
*MOT:they're not [//], they can't come with
us
*CHI:why Jimmy not here ?
```
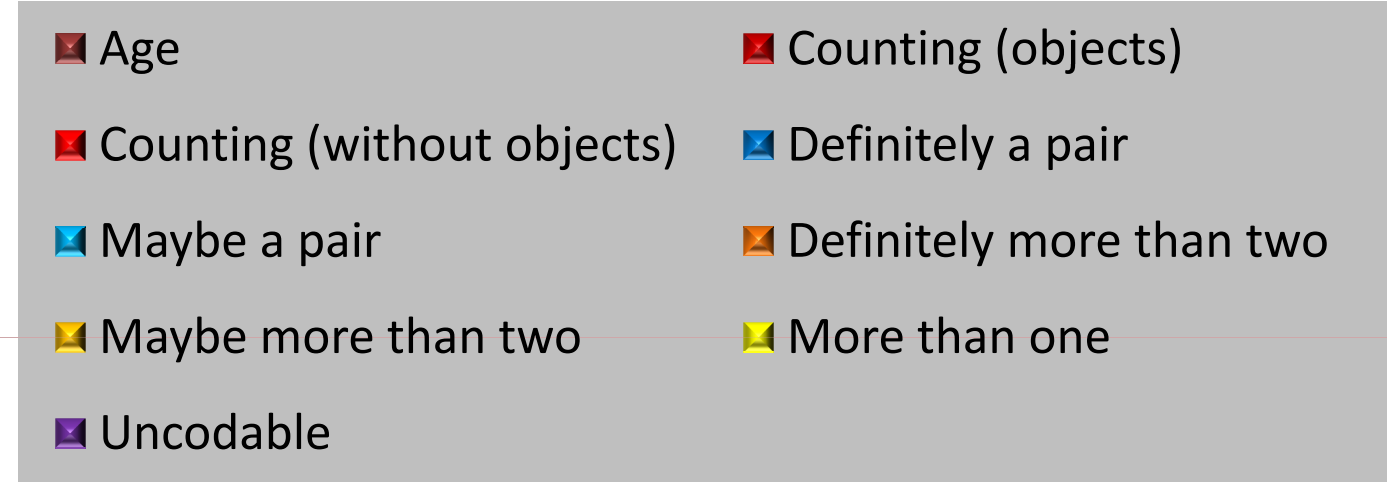
*Utterance containing "two"
*Evidence supporting classification as a pair
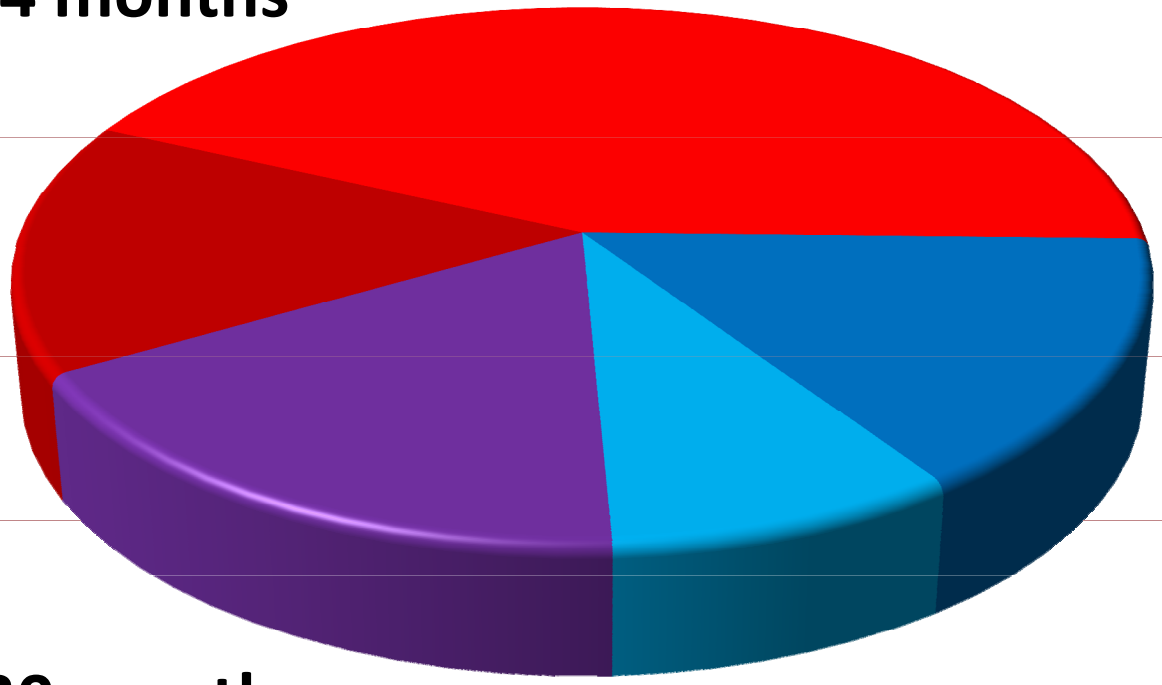
Description of Coding Categories

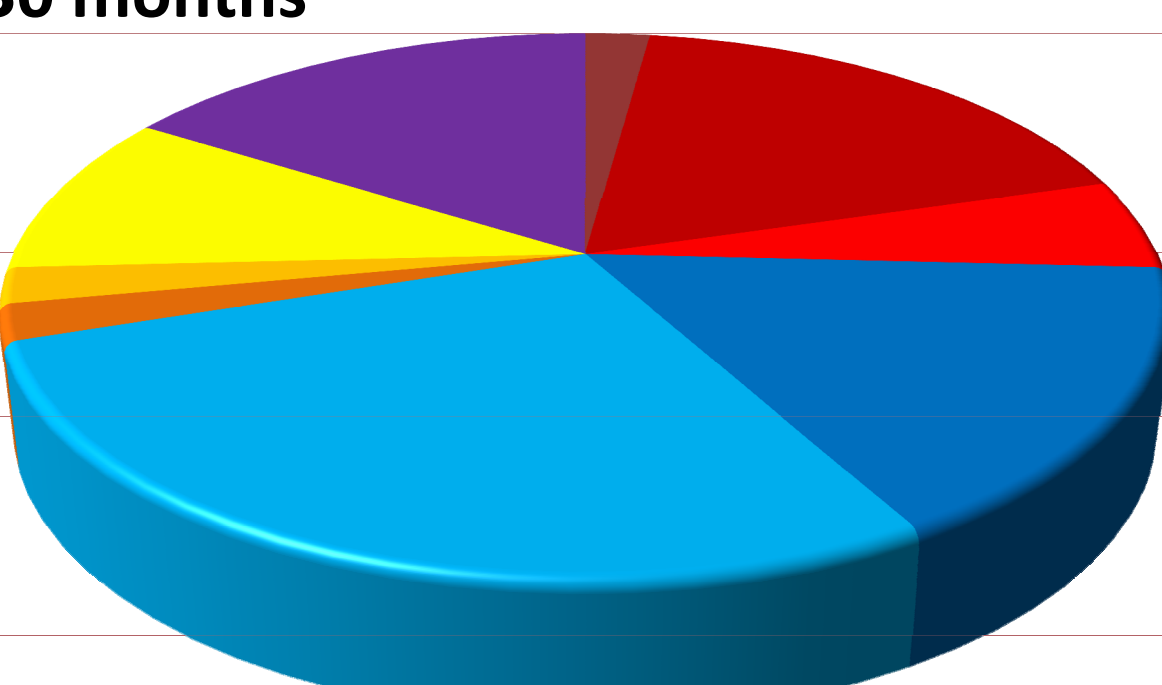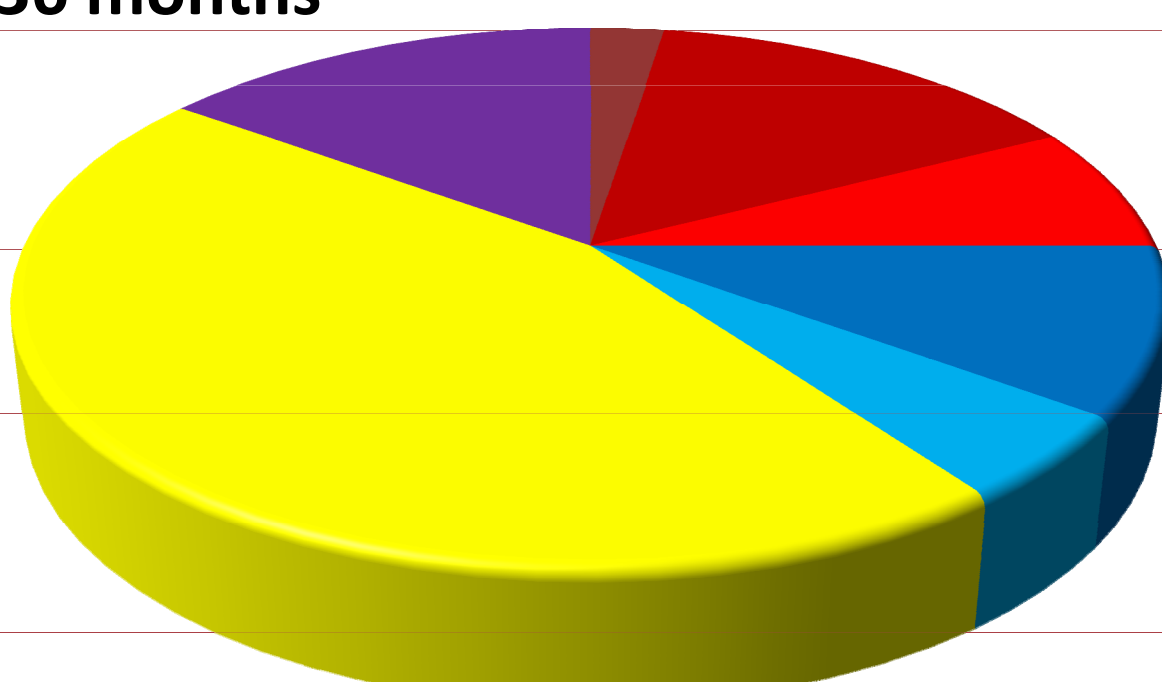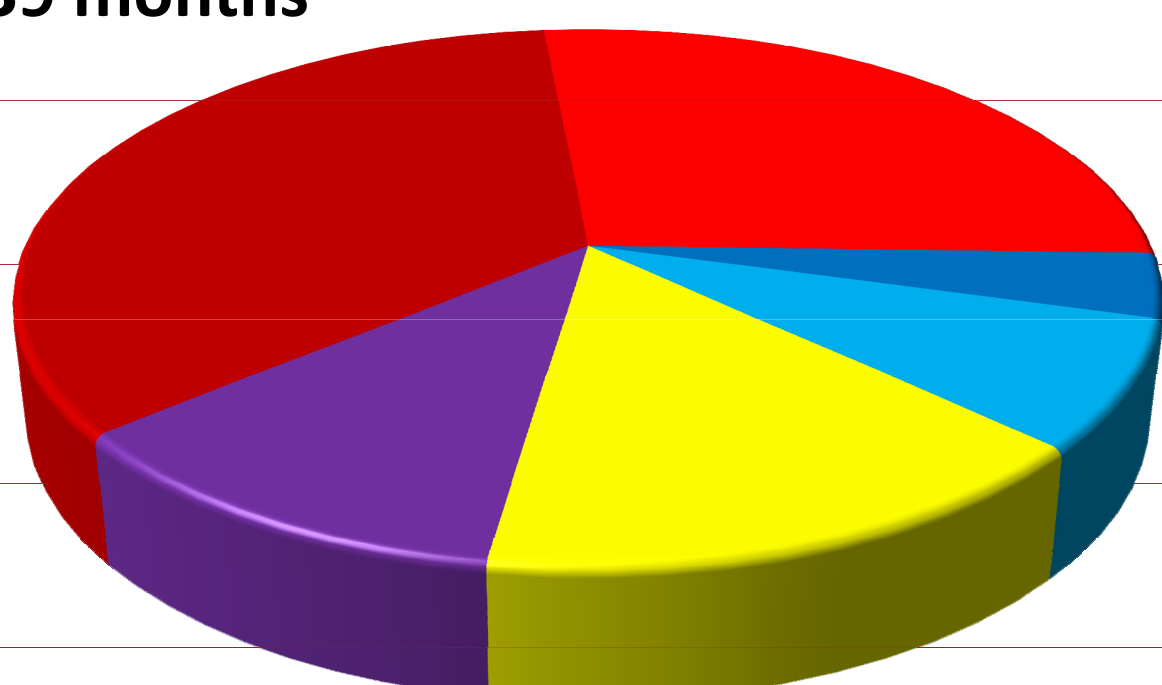| Usage Category	Definition	Context Keys
Definitely a pair	Child is labeling a set of exactly two objects	Look for indication that the child is correct (e.g. parent confirmation)
Maybe a pair	Child seems to be labeling a set of exactly two objects	Insufficient context, evidence indicating the child may have been given help from a parent, etc
Definitely plural	Child is labeling a set of more than two objects	Look for contextual indication that the child is incorrectly labeling a set larger than two objects as two
Maybe plural	Child seems to be labeling a set of more than two objects	Insufficient context
More than one	Child is labeling a set of objects greater than one as two	Look for plurals but unable to discern exact number of objects
Counting (objects)	Counting target objects	Look for counting in addition to the subject of that counting
Counting (without objects)	Counting without any objects	Look for counting for counting's sake or rituals such as, "1, 2, 3, Go!"
Age	Child is referring to his age	"I'm two"
Uncodable	No clues from context to suggest type of usage	No helpful context; clear that the child is just repeating a parent

Results

Usage Distribution

Legend:
- Age
- Counting (without objects)
- Maybe a pair
- Maybe more than two
- Uncodable
- Counting (objects)
- Definitely a pair
- Definitely more than two
- More than one

18-24 months

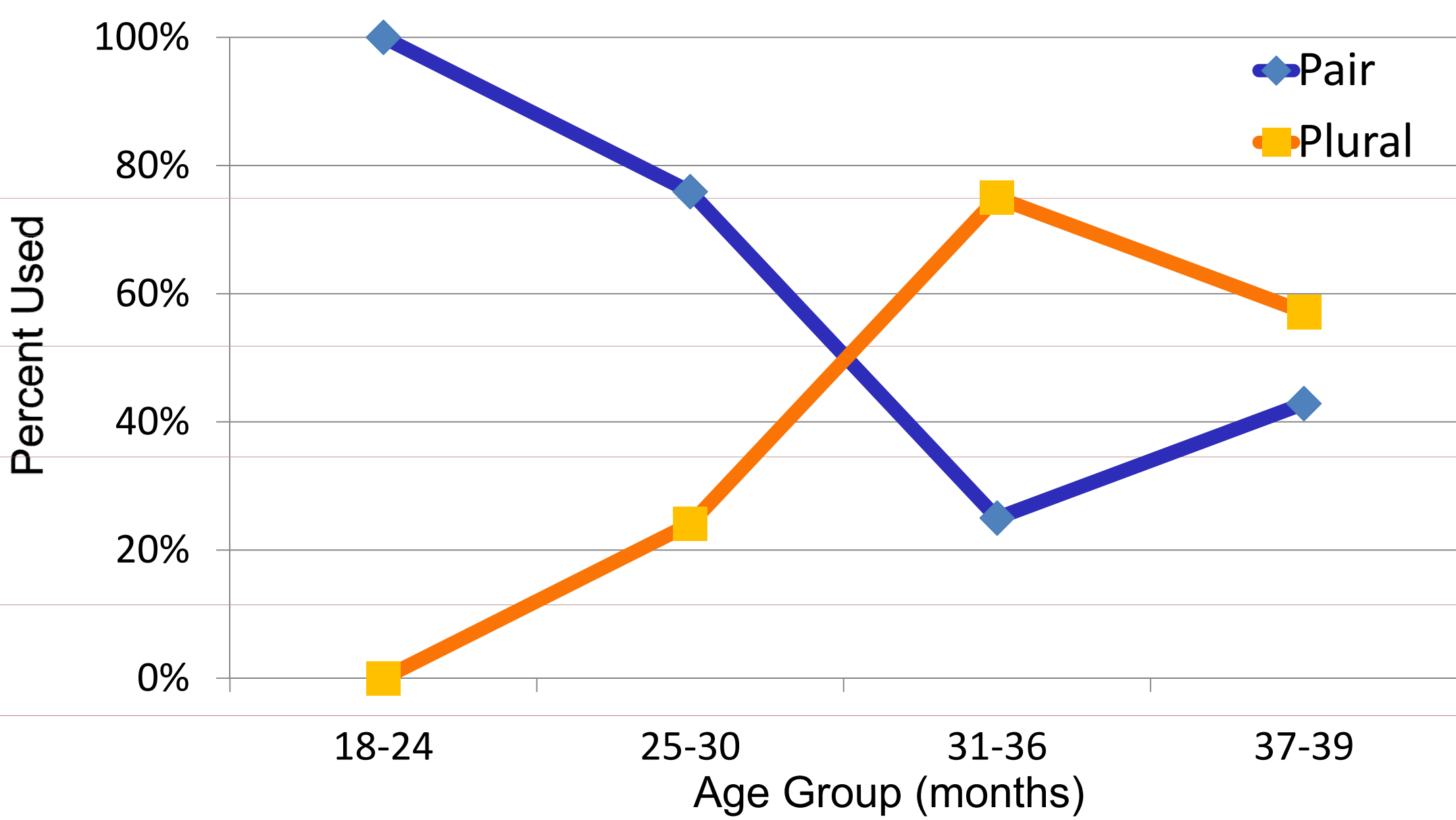**25-30 months**

31-36 months

37-39 months

Pair/Plural Time Series Comparison

*Plural line represents the categories: **definitely plural**, **maybe plural**, and **more than one**
*Pair line represents the categories: **definitely a pair** and **maybe a pair**

A Pearson Chi-Square indicates a significant association between of age group on pair vs. plural usage, $X^2(3) = 27.011$, $p < .001$

Summary of Results

• Usage changes as a function of age.

• There is evidence of early usage of "two" to mean exactly two.

• After an initial burst of correct pair usage, we see a shift towards unspecified plural usage.

• This suggests a U-shaped curve of "two" production: A U-shaped curve generally results from initial success, a period of errors, and a recovery of success.

• A classic example of U-shaped development is over-regularization errors (e.g. "I goed") suggesting early use of "two" may be rooted in morphological development.

Conclusions and Discussion

• Our data and analysis suggest children have a more complicated understanding of the word "two" than previous research suggests.

• Still, more research is necessary before making any strong conclusions.

• Our data may have been influenced by overrepresentation of some children.

• There were a number of samples rated as uncodable or low-confidence.

Future Research

Experiment 1 : Manual Search Task

• Children will be told there are two balls in a box and allowed to search for them.

• Children will be allowed to find one and the second ball will be surreptitiously held from the child's reach.

• Search time will be measured.

• **If children understand that two is a plural, they will continue to search after finding the first ball.**

• Children can search for the second ball.

• Search time will be measured again.

• **If children understand that two is a pair, then they should stop searching after finding the second ball.**

Experiment 2 : Preferential Looking

look! two!
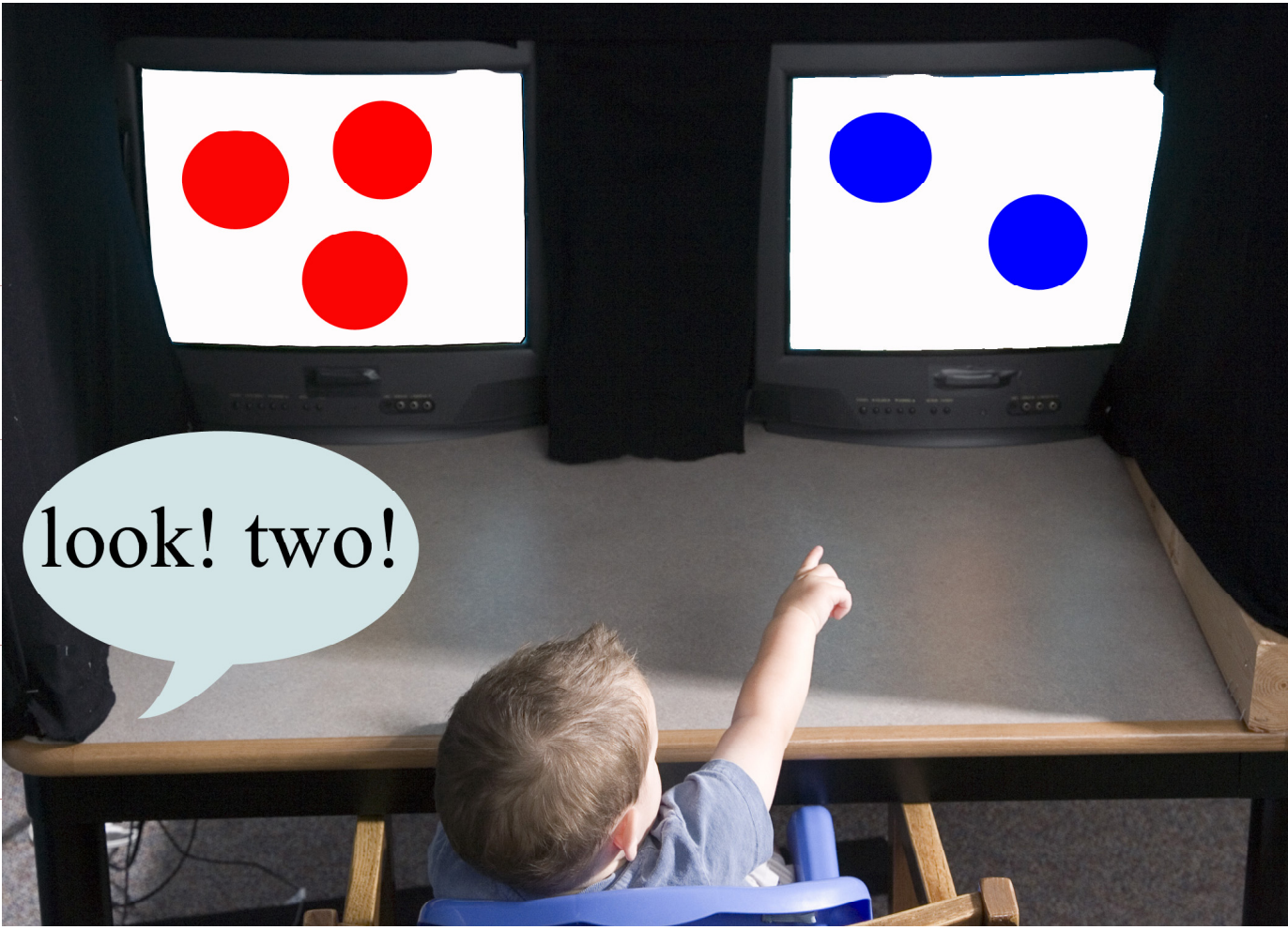
• If the child understand the word "two" as a pair he/she should prefer to look at the screen with two objects rather than three.

• If the child understands two as a plural he/she should only prefer to look at the screen with two objects than one.

References

1. Benson, A. P. and A. J. Baroody (2002). The Case of Blake: Number-Word and Number Development. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans.
2. MacWhinney, B. (2000). *The CHILDES project: Tools for analyzing talk. Third Edition.* Mahwah, NJ: Lawrence Erlbaum Associates.
3. Feigenson, L. and Carey, S. (2003). Tracking individuals via object-files: evidence from infants' manual search. *Developmental Science* 6(5), 568-584.
4. Wynn, K. (1992). Children's acquisition of the number words and the counting system. *Cognitive Psychology, 24*(2), 220-251.

Acknowledgements