

Play, Symbolic Development and Number Knowledge

Selin Kesebir, Kalysta J. Harmon, David H. Uttal; Department of Psychology, Northwestern University

ABSTRACT

Parents and early childhood educators assume that number toys help children acquire the symbolic system of numbers. However empirical research on this question is lacking. Moreover, there are reasons to assume that the assumption may not always be true.

In the current studies we examined the relation between number knowledge and play with number toys. In Study 1 participants played structured games with number toys and similar non-number toys. In Study 2 participants played freely with an experimental set of number blocks and control sets of shape/color blocks. Our results suggest that children's play behavior with number vs. non-number blocks are mediated by their number knowledge.



STUDY 1

- We examined the relation between playing with number toys or standard toys and children's number knowledge.
- Participants were 35 children ages 46-56 months. Each child received left with a set of either number or non-number toys to play with over a period of two weeks.
- Researchers demonstrated the games to parents, and parents were asked to make sure their children played the games and to keep a log of their play.

Materials

| Experimental Group | Control Group |
|--------------------|---------------|
| | |
| | |
| | |

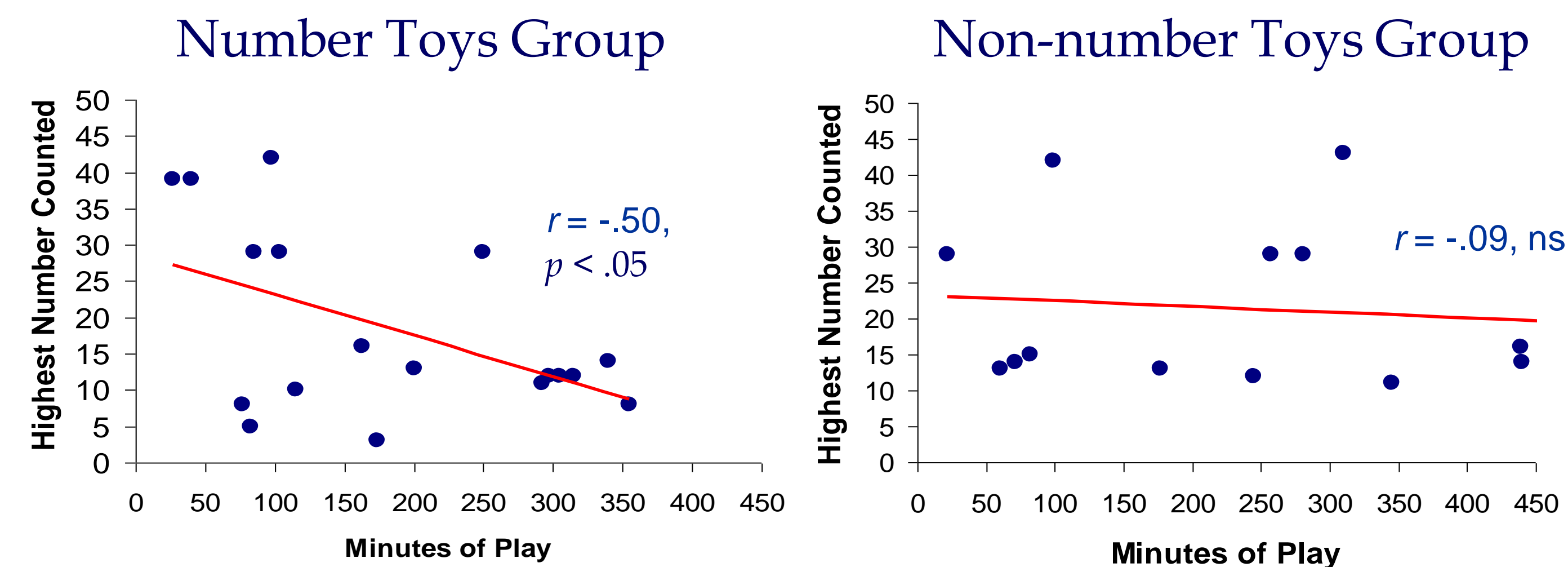
| Sample play activities | |
|------------------------|-----------------------|
| EXPERIMENTAL | CONTROL |
| Number Tower | Tower with blocks |
| Number Jewelry | Jewelry with beads |
| Play-Doh Numbers | Play-Doh shapes |
| Magnet Pictures | Pictures with magnets |

STUDY 1-RESULTS

- For children who played with the number toys, there was a negative correlation ($r = -.50, p < .05$) between time spent playing with number toys and the highest number the child could count.
- There was no comparable correlation for the children who played with non-number toys ($r = -.09, ns.$).

STUDY 1-RESULTS (cont'd)

Relationship between Playtime and Counting



STUDY 2

Questions

- How do children interact with number toys and non-number (control) toys?
- How does children's number knowledge affect their play behavior with number and non-number toys?

Participants:

- 19 children, 32 - 48 months old, median age = 44 months

- Participants assigned to play either with number blocks or "color" blocks

Experimental Design:

- After warm-up activities (a puzzle and a book) children are given **two sets of blocks (number or shape/color) in counterbalanced order.**
- The **children's play is not structured** by the experimenter, they are left to play freely with the blocks.
- After the children are done playing with the blocks their **number knowledge is measured** by asking them to name the numbers 0 - 9 on flashcards and by asking them to count as high as they can.
- Children are also shown a number block and asked "*can you tell me what this is?*".

Number Blocks Shape Blocks Color Blocks

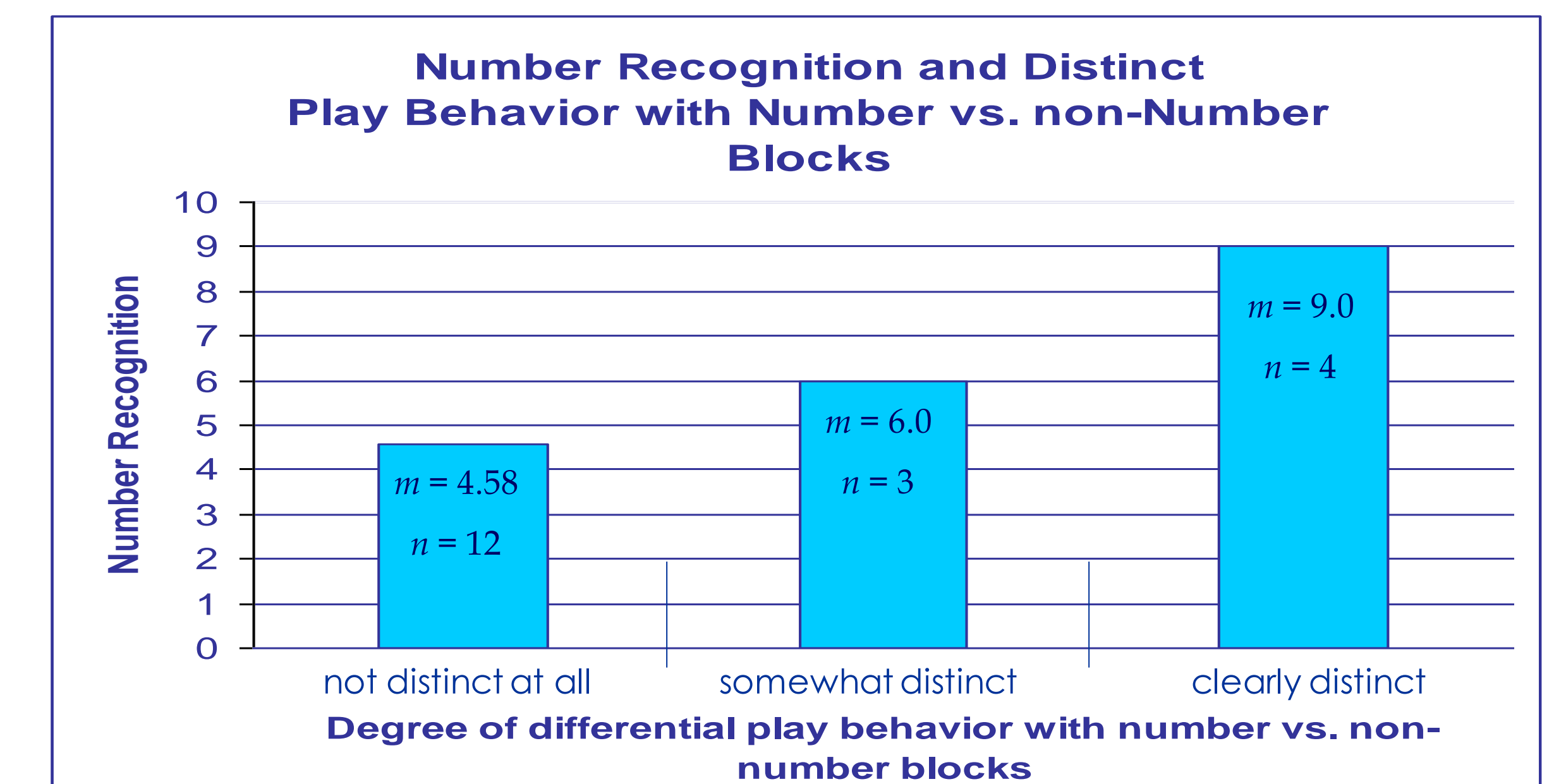


STUDY 2-RESULTS



Differentiating between number and non-number blocks in free play

- We coded the extent to which children played with number and control blocks in similar ways. Children with higher number knowledge treated the blocks and the number differently; those with low levels of number knowledge did not.
- Children who differentiated number and non-number blocks in their free play spent less time playing with number blocks ($r = -.482, p = .037$); but they did not spend less time playing with non-number blocks ($r = -.081, ns.$).



CONCLUSIONS

- As children's knowledge of numbers increases they start to treat number blocks differently from non-number blocks. In contrast, children with less number knowledge treat both types of blocks similarly, e.g. build towers with both.
- The extent to which children treat the two types of blocks differently predicts how long they play with number blocks but it does not predict how long they will play with non-number blocks. Children who distinguish between number and non-number blocks in play seem to find number blocks to be less fun. Once something becomes a symbol, it is less interesting as a toy.

ACKNOWLEDGEMENTS

- This research was supported by US Department of Education, grant number R305H020088.
- We thank Rebecca Newland, Audrey Meyer and Maeve Hennerty for their assistance in this study.