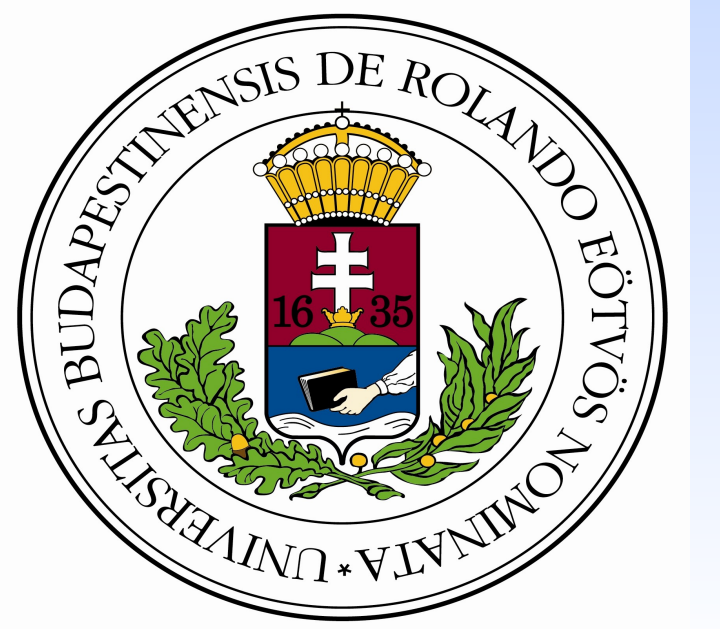


Basics of the number concept: Set correspondence in early childhood

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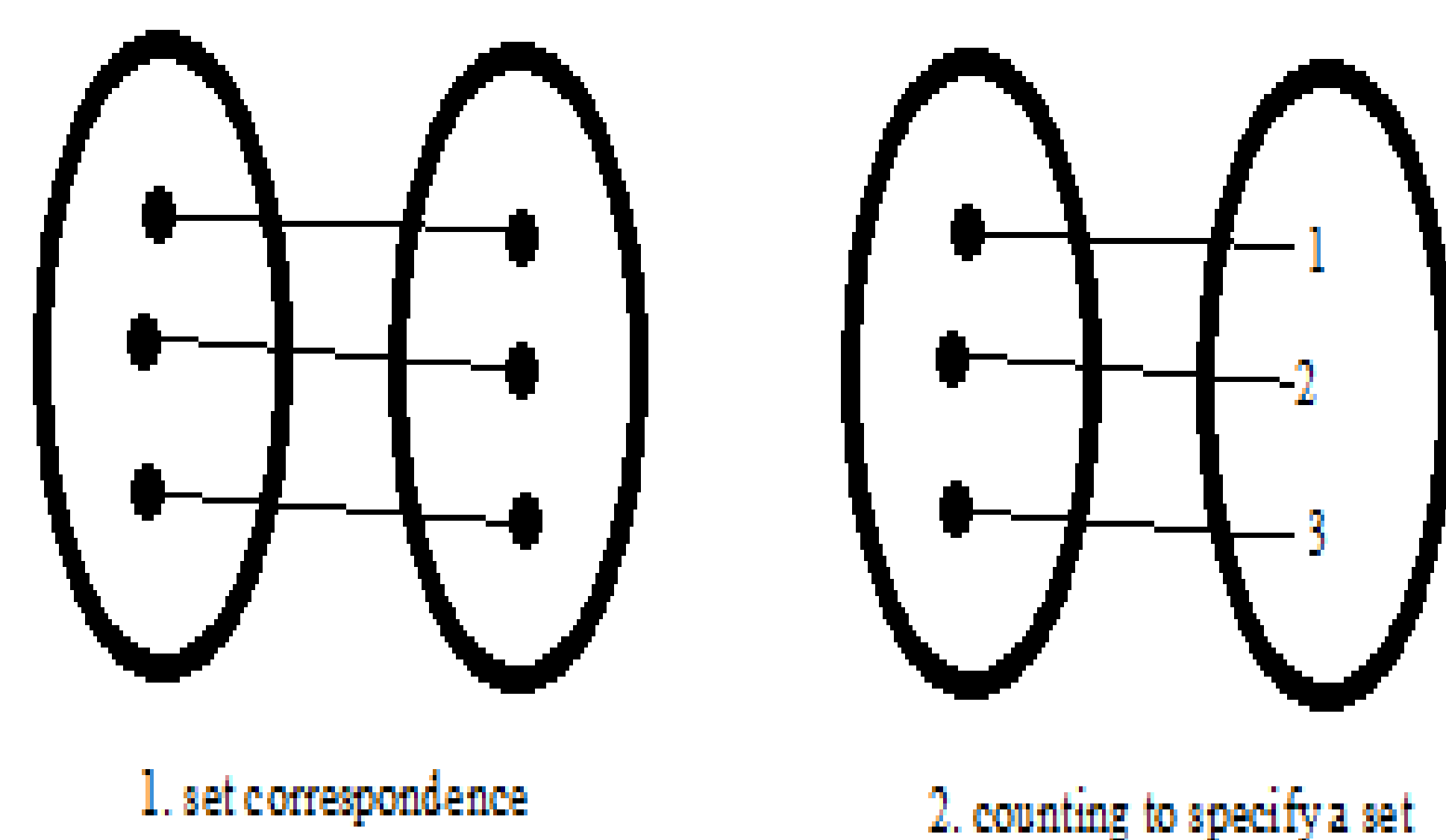


Introduction

According to the development of understanding numbers, children at the age of 2 can tell number words up to 10, but only at the age of 3 and 4 start to use numbers to quantify a set.

There is a debate, whether children understand the number-specific principles before they can count and understand how counting specifies the size of a set. Gelman and Gallistel (1978) proposed that there are innate number-specific principles that underlie the counting ability. Most of the researchers, for example Wynn (1990; 1992) argues against this statement. She assessed children's number knowledge by the Give-n task, and she stated that children before understanding cardinality, do not understand anything about counting.

Some task analysis (e.g., Russel (1920)), suggest that it is possible to understand some aspects of exact numerosity before being able to specify a value: one might understand that the property of numerosity is parallel with matching sets. Based on Russell, in our computational analysis, we suggest that understanding counting has two components. The first one is the knowledge that equal sets have the same numerosity, or in other words set correspondence, and the second one is the knowledge how to specify numerosity with number words, or in other words, understanding cardinality (you can see it on the figure below).



Today the accepted method to measure children's number knowledge is the Give-n task, but this task requires both of the components. We assume that, children might possess the first component, before they understand cardinality, so children might understand set correspondence.

Methods

To measure whether this more simple concept of number is available before understanding cardinality we use a task, which doesn't require number words.

Clothes washing

In this task we demonstrate children playing clothes washing. We tell a story, that we are in a laundry, and we have trousers and t-shirts, but this time we are washing only t-shirts. In every washing, we put t-shirts in the washing machine (closed box), while trousers are always in front of children. During the washing time, we change the set of t-shirts, or trousers with the following operations.

- Subtraction: The experimenter takes out one t-shirt from the washing machine, or takes away one trousers.
- Addition: The experimenter puts one more t-shirt in the washing machine, or adds one more trousers.
- Rearrangement: The experimenter shakes the washing machine, to rearrange t-shirts, or mixes the trousers.
- Exchangement: The experimenter takes out one t-shirt from the washing machine, and puts in an other one, or takes away one trousers, and adds an other one.

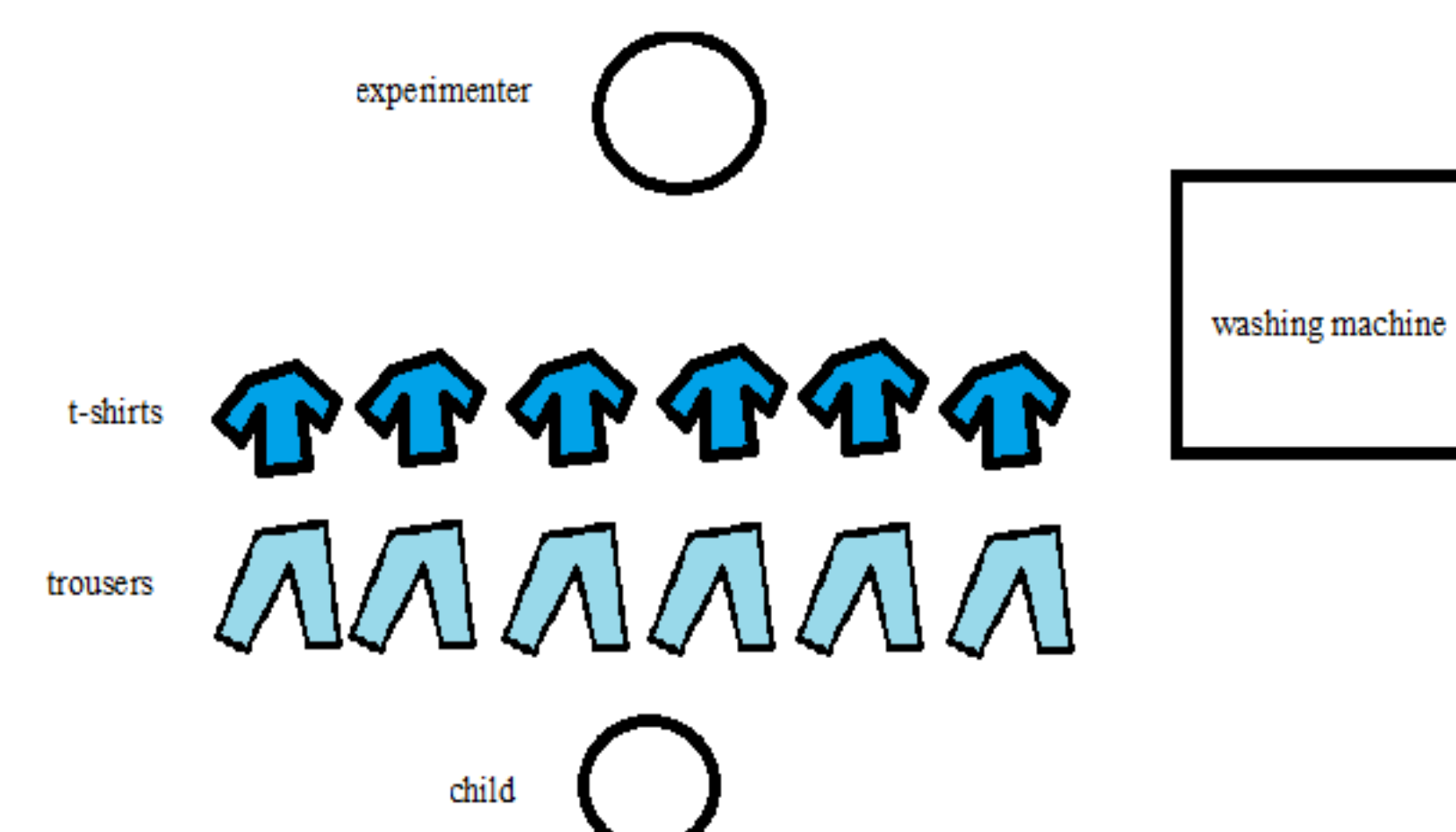
During set operations, the experimenter tells a story, why she does this thing. For example during addition, she says that, we get one more t-shirt to wash, or we get one more trousers. We always start with 6 t-shirts, and 6 trousers.

At the end of the washing, in half of the trials, we take out everything from the washing machine (empty condition), while in the other half we leave one t-shirt in the washing machine (not empty condition). After every trial we ask children whether is t-shirt in the washing machine or not.

34 children participated in the experiment who were 3 and 4 years old.

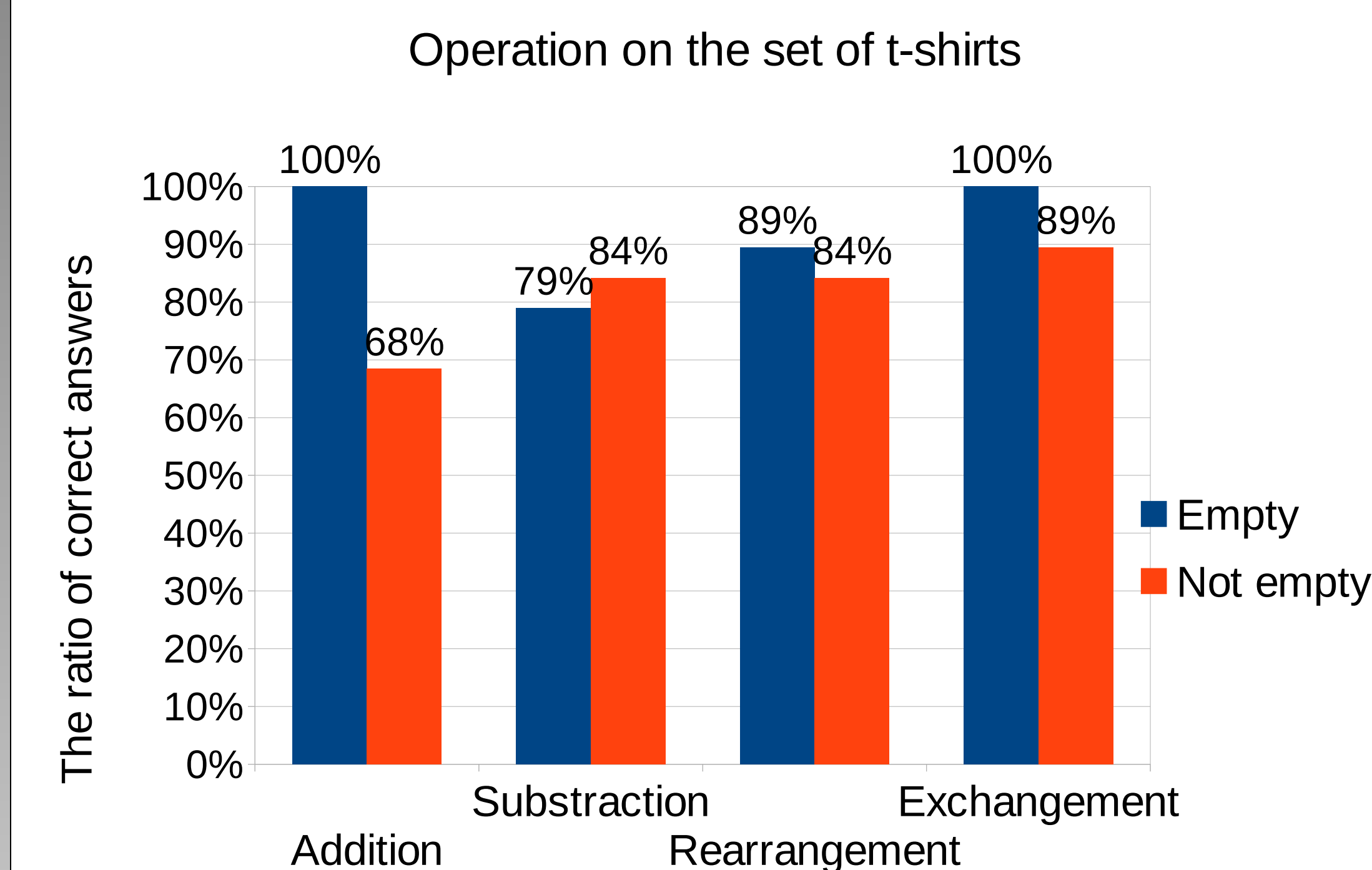
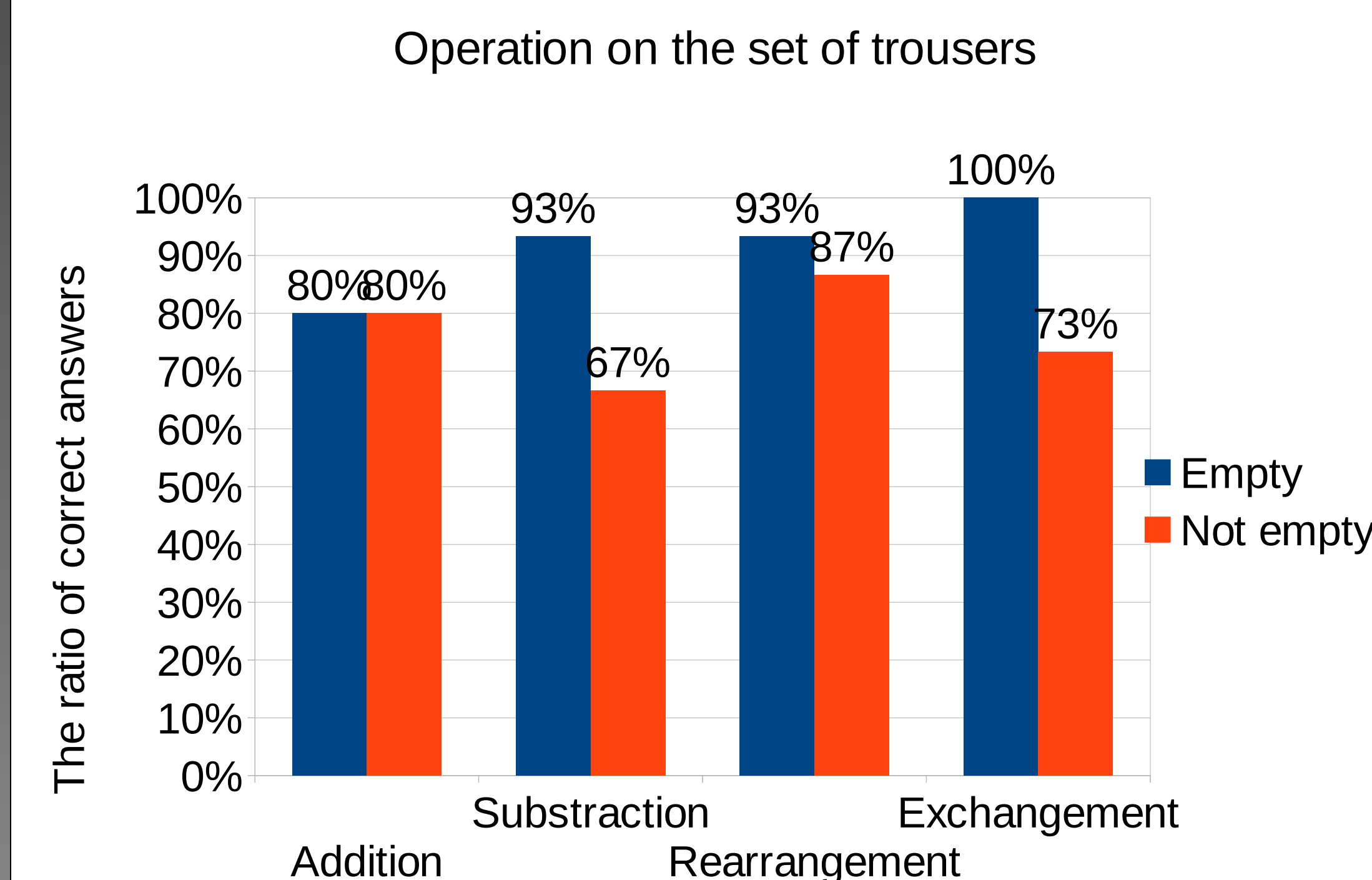
Procedure:

1. Clothes washing
2. The Knowledge of the count list
3. The Give-n number task



Results

The ratio of correct answers in set operations



Our results show that children answer correctly after set operations, because the ratio of correct answer is more than 50% in every condition.

Conclusions

Preschoolers could track whether the one-to-one correspondence was changed by the operation, although the sets were too large for them to track the items or the specific values. This result shows that subset-knower preschoolers may understand an initial set of principles for understanding exact numerosity.

Next extension of our work: We designed the next work to reproduce our results with experimenters who blind the aim of the experiment.

Bibliography

- Gelman, R., Gallistel, C. R. (1978). *The child's understanding of number*. Cambridge, MA: Harvard University Press.
- Russell, B. (1920). *Introduction to Mathematical Philosophy*. George Allen and Unwin: London.
- Wynn, K. (1990). Children's understanding of counting. *Cognition*, 36, 155–193.
- Wynn, K. (1992). Children's acquisition of the number words and the cognitive system. *Cognitive Psychology*, 24, 220–251.

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If you have any questions please let us know!
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