Is the SNARC effect associated with pre-mathematical and spatial abilities in preschool?

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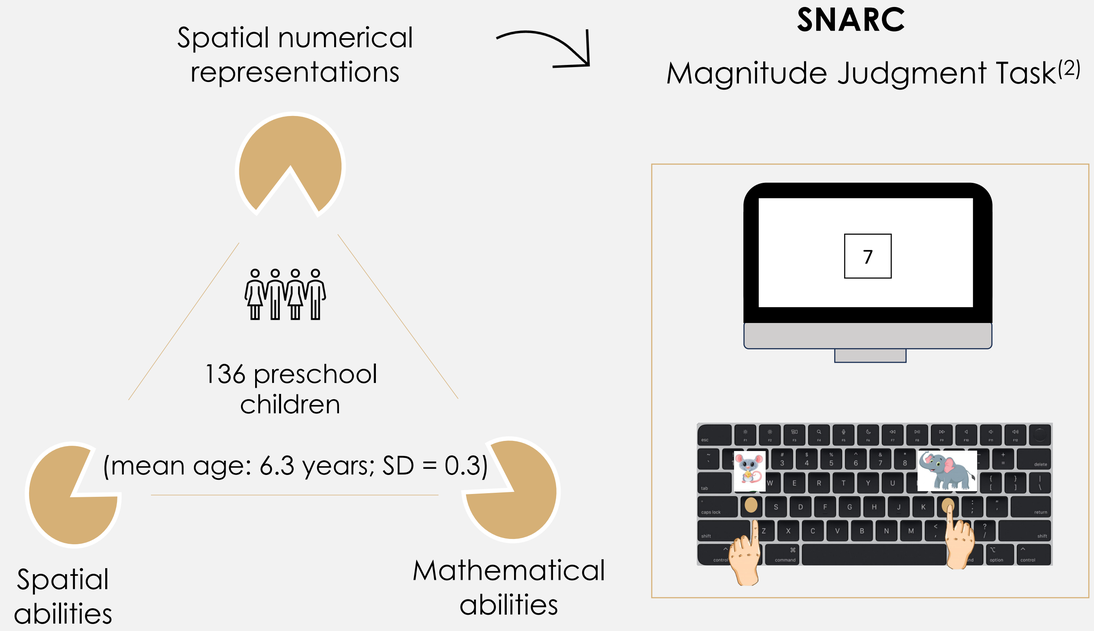
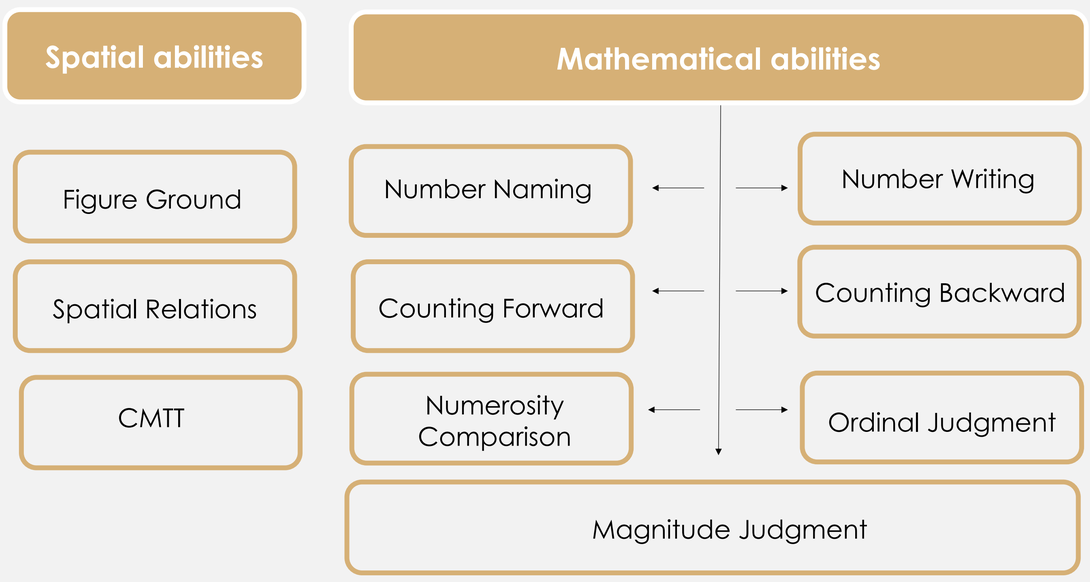
Introduction

The SNARC (Spatial-Numerical Association of Responses Codes) effect is a cognitive phenomenon describing the mental association between numbers and space, more precisely the association of smaller numbers on the left side and the larger numbers on the right side. Yet, the functionality of this association in mathematical and spatial abilities remains unclear.(1)

The present study investigates the **possible triangular relationship between these concepts in preschool children.**

Methods





Two principal component analyses were performed to reduce the number of variables.
Two factors were provided: one for mathematical abilities and one for spatial abilities.

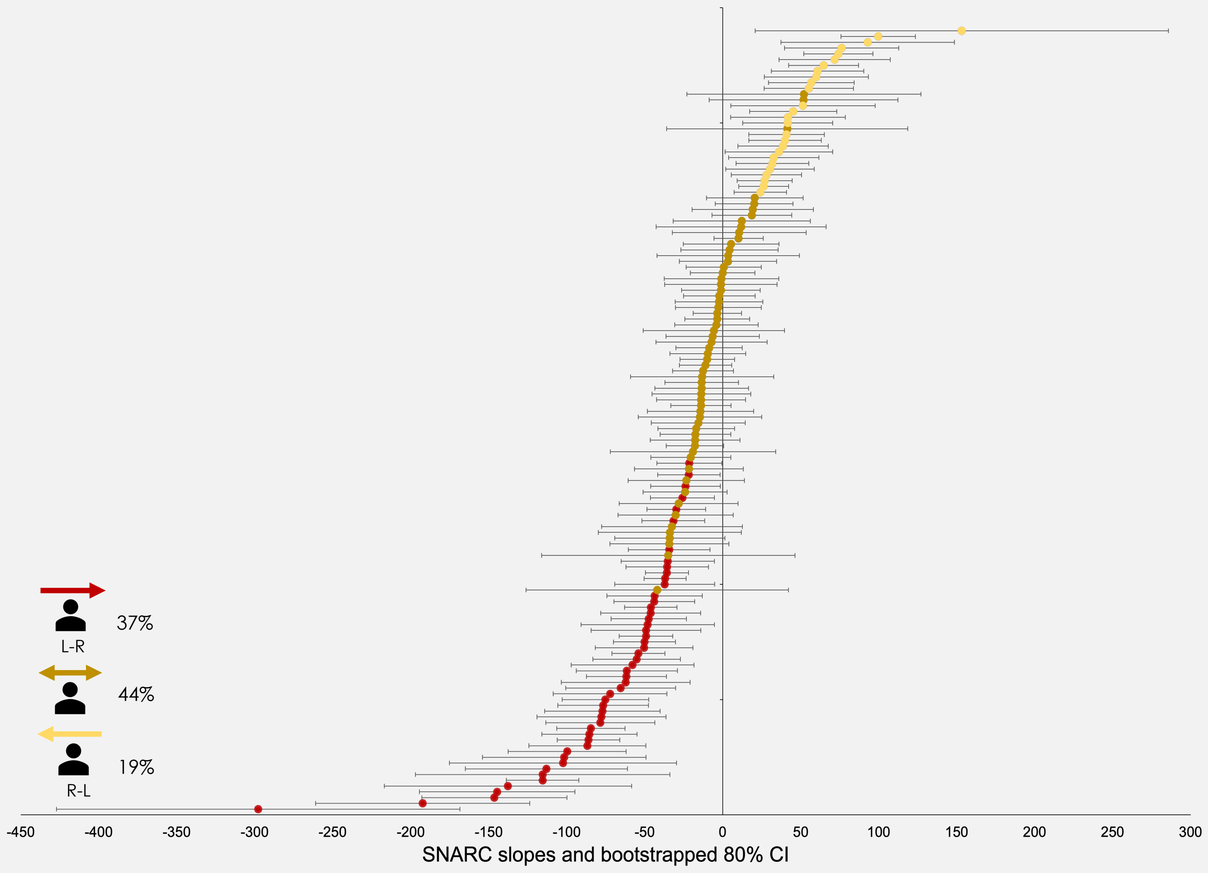
Data Analysis

Two steps of analysis were conducted :

1. **Prevalence of preschool children with consistent SNARC effect**
   a. Bootstrapping approach (Cipora et al., 2019)(3) to compute 5000 linear regression slopes per participant
      - A **negative mean** regression slope reflects **the presence of SNARC**
      - Calculate 80% Confidence Interval (CI) per participant
      - CIs do not cross 0: the SNARC is consistently present
2. **Relationship of the SNARC with pre-mathematical and spatial abilities**
   a. One-Way ANOVAs
      - **Group:** SNARC Consistency

Results

1. **Prevalence of preschool children with consistent SNARC effect**

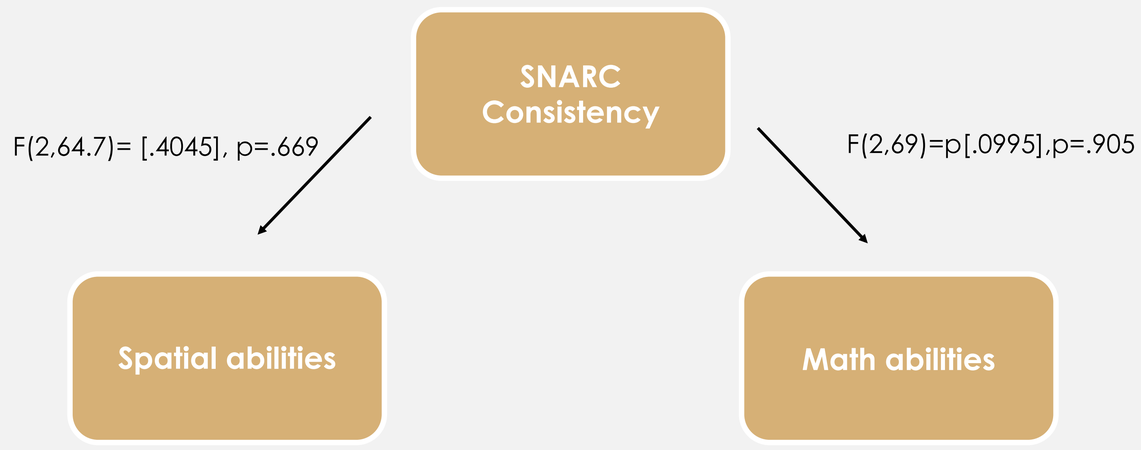


The individual analysis showed a reliable SNARC in 56% of the children.

Among those, 37% coded numbers from left-to-right while 19% were right-to-left.

2. **Relationship of the SNARC with mathematical and spatial abilities**

a. One-Way ANOVAs



SNARC consistency is not concomitant with an advantage in spatial or mathematical skills

Conclusion

- Our results suggest that **56% of children** show a **consistent spatial-numerical mapping** (37% left-right; 19% right-left), suggesting that access to spatially orientated mental representation emerges at an early stage of development.
- Although this **numerical-spatial consistency** is present in some children, it **does not seem to represent an advantage**/ they rely (yet) on these associations while performing numerical and spatial tasks.

References

(1) Cipora, He & Nuerk (2020). Annals of the New York Academy of Sciences

(2) Hoffmann, Hornung, Martin & Schiltz (2013). Journal of experimental child psychology

(3) Cipora *et al.* (2019). *PsyArXiv*

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