BACKGROUND

Research suggests:
1. Early math skills are a strong predictor of later achievement in schooling (Claessens et al., 2009).
2. Fractions and division are important skills for long-term success with mathematics (Siegler et al., 2012).
3. Young children can distribute toys and food equally (Olson & Spelke, 2008), suggesting the ability to divide items exists prior to 3 years of age.

METHODS

Participants: 49 preschool (29 female) and 82 school aged (35 female) children (n=131) completed the tasks at museums and libraries in a Midwestern town.

TASKS

Implicit Mathematical Task: Compare two colors of circles and determine which color had more circles (Panamath). There are two ways this task is scored:
1. Accuracy: the total percent of trials the participant answered correctly.
2. Weber Fraction: the smallest ratio between dots a participant can accurately distinguish (lower numbers are better).

Explicit Mathematical Task: Uses a number line to physically map numerical quantities onto paper (Number Line Estimation Task).

Social Division Task: Compare two sharing scenarios, and decide which character is being “nicer”. There are two conditions to this task:

1. Absolute: Each character gives the same absolute number of candies, although one is giving a higher proportion of candies

2. Conflict: The character that gives fewer candies to the child is giving a higher proportion of candies (more of their share).

RESULTS

Q: Is there an association between mathematical reasoning and a social cognitive division task in children?

A: YES. Children with better standard measures of mathematical reasoning also performed better on the social cognitive division task of sharing items. There was a positive correlation between preschool children’s absolute accuracy and implicit math accuracy (r=.531, n=20, p=.019), and a negative correlation between preschool children’s absolute accuracy and implicit math Weber fraction (r=-.692, n=17, p=.003). There was a negative correlation between school aged children’s conflict accuracy and implicit math Weber fraction (r=-.307, n=37, p=.071).

School aged children were more accurate on all tasks, especially in the conflict condition of the social division task.

CONCLUSION

The present study provides preliminary evidence that there is an association between social cognitive sharing and mathematical abilities in young children. Future goals include using the social division task in combination with functional Near Infrared Spectroscopy (fNIRS) to better understand neural cognitive bases of emergent mathematical abilities.

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