

Parent-Child Number, Spatial, and Pattern Experiences at Home Relate to Parents' Math Beliefs

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Background

- Much of the research on early mathematics development focuses on numeracy.¹
- However, emerging evidence shows that early patterning and spatial skills are also important predictors of later mathematics achievement.²⁻⁴
- Children's early math skills vary significantly even before school entry, and this puts some at risk for math failure later on.¹
- Parents can support their children's numeracy and spatial skills by engaging them in number and spatial activities.⁵⁻¹¹
- Parents report engaging their children in various pattern, spatial and number activities at least once per week.¹²⁻¹⁵
- Parents' math-related attitudes, and beliefs are associated with their efforts to engage their children in number and spatial activities at home.^{9, 12, 14, 16}
- Little is known, however, about how frequently parents engage their children in pattern activities in relation to number and spatial activities, or how parents' math-related beliefs relate to their efforts to support this range of early math skills at home.

Questions

- How frequently do parents engage their pre-kindergarten children in pattern versus number and spatial activities at home?
- How do parents' math beliefs and values relate to the frequency with which they engage their children in a range of math activities at home?

Participants

- 62 parents of 4- and 5-year-old children were recruited from 6 public and private preschools in a southeastern city.
- Most parents were mothers (84%) and around half reported being racial or ethnic minorities (54%).
- About half of the preschoolers were female (52%) and were reported as racial or ethnic minorities (55%).
- Most of the parents reported having associate's, undergraduate, or graduate degrees (73% of mothers and 56% of fathers).

Method

Procedure

- 2 surveys were sent home to parents via mail or email.

Home Math Activity Survey

- Parents reported how frequently they engaged their children in math activities at home using 25 items on a 6-point scale.^{5,11,17}

Home Math Activity Survey	
Activity Type	Examples of Activities
Number	Talk about written numbers (e.g., "That's a 7")
	Compare quantities (e.g., when playing card games or serving food for dinner or sharing toys)
Spatial	Play with puzzles (e.g., picture puzzles, tangrams)
	Build with construction toys (e.g., building blocks, Legos, magnet sets, Lincoln logs)
Pattern	Make or copy patterns with objects or sounds (e.g., putting blocks in a red-blue-red-blue pattern; clap-clap-snap pattern)
	Describe patterns in words

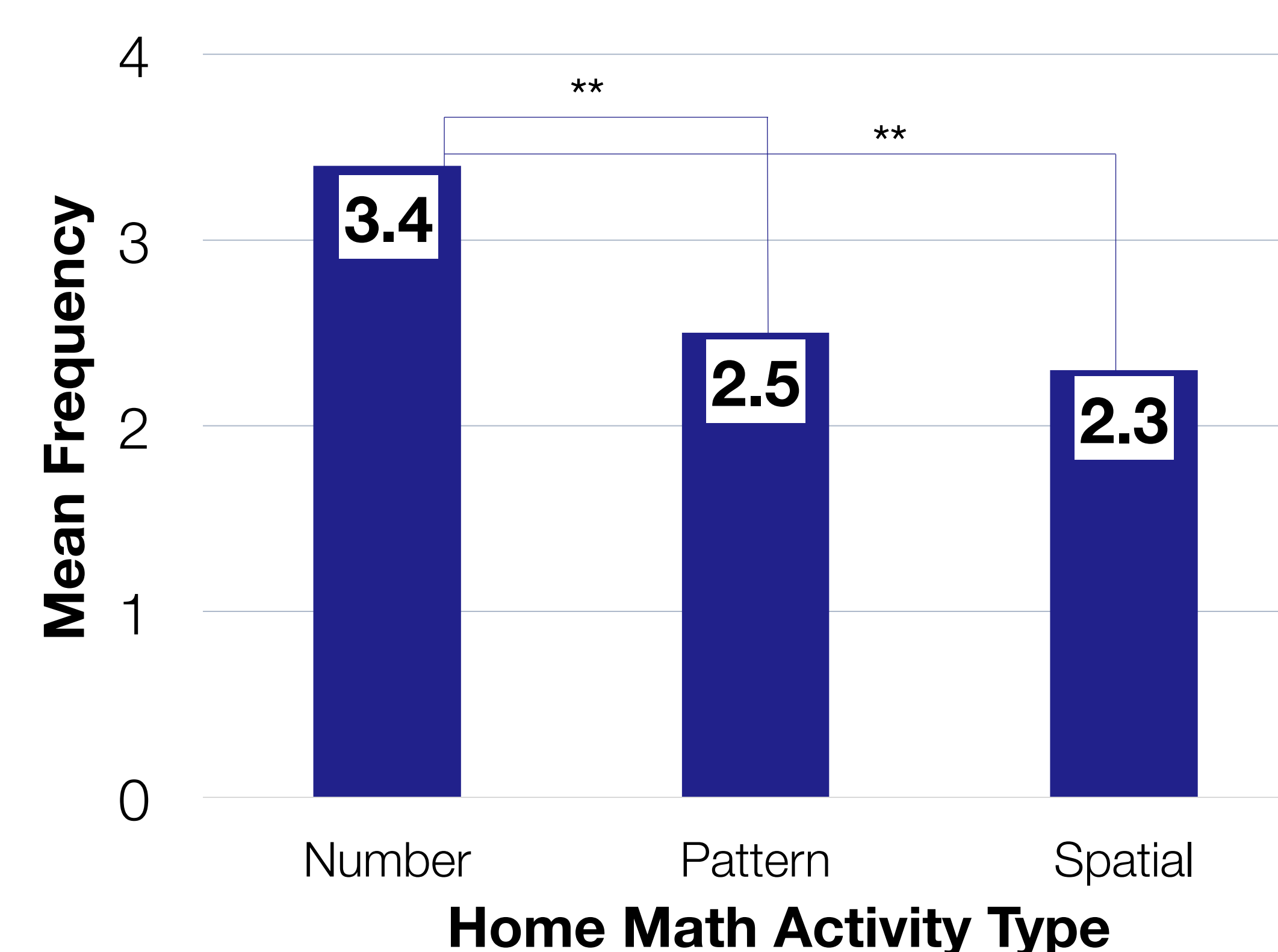
(0 = never, 1 = once a month or less, 2 = 2-3 times a month, 3 = 1-2 times a week, 4 = 3-4 times a week, 5 = daily)

Parent Belief Survey

- Parents reported their math related beliefs by responding to 11 items on a 7-point scale.^{11, 17,18}

Results

Frequency of Math Activities at Home



**p < .01

(0 = never, 1 = once a month or less, 2 = 2-3 times a month, 3 = 1-2 times a week, 4 = 3-4 times a week, 5 = daily)

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Results

Parent Belief Survey

Parents' Beliefs About Themselves	M(SD)		
	Number	Spatial	Pattern
Estimate of own ability in __ tasks ^a	5.3(1.5)	5.2(1.3)	
Importance of being good at __ tasks ^b	6.2(1.1)	5.4(1.6)	
Liking of __ activities ^c	4.8(1.9)	5.3(1.8)	
Nervous or anxious about __ tasks ^d	3.0(2.0)	2.5(1.7)	

Parents' Beliefs About Their Children	M(SD)		
	Number	Spatial	Pattern
Child ability in ___ tasks (current, innate, and future) ^a	5.9(0.9)	5.9(0.9)	5.5(1.0)
Importance of child being good at ___ tasks ^b	6.6(0.7)	6.2(1.1)	6.3(1.0)
Usefulness of ___ skills for child in the future ^e	6.9(0.4)	6.5(1.0)	6.7(0.8)
Child's liking of __ activities ^c	6.2(1.1)	6.3(1.0)	5.6(1.4)

^a 1 (not good) – 7 (very good) ^b 1 (not at all important) – 7 (very important) ^c 1 (not at all) – 7 (very much) ^d 1 (not at all anxious) – 7 (very anxious) ^e 1 (not at all useful) – 7 (very useful)

Correlations Between Home Math Activity Engagement & Parents' Beliefs

Parents' Beliefs About Themselves	Math Activities at Home		
	Number	Spatial	Pattern
Number Ability ^a	.09	.19	.14
Spatial Ability ^a	.22	.36**	.30*
Importance of being good at number tasks	-.03	-.03	.28*
Importance of being good at spatial tasks	.13	.05	.11
Liking of number tasks	-.06	.08	.03
Liking of spatial tasks	.09	.18	.28*
Nervous or anxious about number tasks	-.14	-.14	-.11
Nervous or anxious about spatial tasks	-.28*	-.22	-.19

Parent Beliefs About Children	Number	Spatial	Pattern
Child's number ability ^b	.36**	.24	.29*
Child's spatial ability ^b	.35*	.33*	.25
Child's pattern ability ^b	.37**	.19	.35**
Importance of child being good at number tasks	.00	-.07	.07
Importance of child being good at spatial tasks	.06	-.05	-.06
Importance of child being good at pattern tasks	.07	-.01	.02
Usefulness of number activities for child in the future	.00	-.05	-.04
Usefulness of spatial activities for child in the future	.09	.00	-.13
Usefulness of pattern activities for child in the future	.12	.10	.01
Liking of number activities	.28*	.16	.35**
Liking of spatial activities	.25	.19	.17
Liking of pattern activities	.23	.18	.27*

*p < .05. **p < .01.

^a Includes parent's estimated current ability, and ability while in school

^b Includes parents' estimates of children's current, innate, and future abilities

Discussion

- These findings suggest that parents reportedly engage their preschool children in pattern and spatial activities for a comparable amount of time, but less frequently than number-related activities.
- The frequency of spatial, pattern, and number activity engagement is positively related to parental beliefs about children's spatial, pattern, and number skills. This may suggest that early number, pattern, and spatial experiences have within-skill and crossover effects on development in these areas.⁶
- Alternatively, parents may engage their children more in activities where they believe their children are best able to excel.
- Parents seem to be concerned about their children's level of interest in, but not the usefulness of number, pattern, and spatial activities in guiding their children's development in these areas.
- Finally, parents less anxious about number and spatial activities tend to be somewhat more likely to engage their children in these types of activities at home.

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