Exploring the Relations Between the Home Mathematics Environment and Direct and Indirect Numeracy Assessments

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Background

Prior research examining the HME has typically focused on direct and indirect numeracy activities (LeFevre et al., 2009, 2010; Skwarchuk et al., 2014)

Recent research suggests the HME direct and indirect numeracy activities predict direct child assessments when accounting for age, sex, and parent education (Purpura et al., 2020)

Question

Are there differences in the relation between the HME and direct child assessments when the assessments are examining direct or indirect numeracy?

Methods

Sample
Parents completed a survey that included questions about general demographics including their highest education and various at-home math activities (*N*=51)

HME Scale
1(Almost Never), 2(Every so often), 3(1 to 3 times a week), 4(4 to 6 times a week), 5(Daily)

How often do you count objects with your child?
How often do you engage with your child in identifying written numbers?
How often do you engage with your child in printing numbers?
How often do you do math activities with your child?
How often do you play card games with your child?
How often do you play number games with your child?
How often do you talk about money with your child?
How often do you measure ingredients with your child when cooking?
How often do you use calendars with your child?
How often does your child wear a watch?

Direct Numerical Assessment
Math Garden – Addition. Individualized, dynamic, computer math game assessing math abilities with direct questions of addition
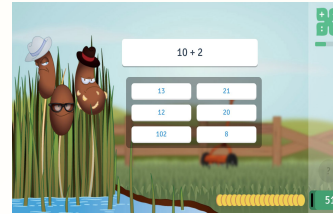
Indirect Numerical Assessment
Woodcock-Johnson Applied Problems. Standardized assessment designed to examine mathematical abilities in everyday contexts

Results

Table 1. Descriptives for students and assessment scores.

Variables	N	M(SD)	Min	Max
Parent Education	51	4.804(1.253)	1	6
Child Age	51	5.613(0.352)	4.92	6.67
Child Sex	51	0.471(0.499)	0	1
HME	51	3.073(0.633)	1.5	4.4
WJAP	51	19.412(4.330)	2	26
Math Garden	51	-1.006(2.251)	-5.43	3.77

Table 2. Regression by Assessment

	Direct Numeracy	Indirect Numeracy
Variable	β (SE)	β (SE)
Parent Education	0.14 (0.26)	0.23 (0.51)
Child Age	0.21 (0.89)	0.06 (1.71)
Child Sex	-0.22 (0.66)	-0.22 (1.26)
HME	0.13 (0.51)	0.17 (0.98)
Note. *p <.05, **p <.01, ***p <.001		

$r(51) = 0.18$, $p = .11$

$r(51) = 0.18$, $p = .20$
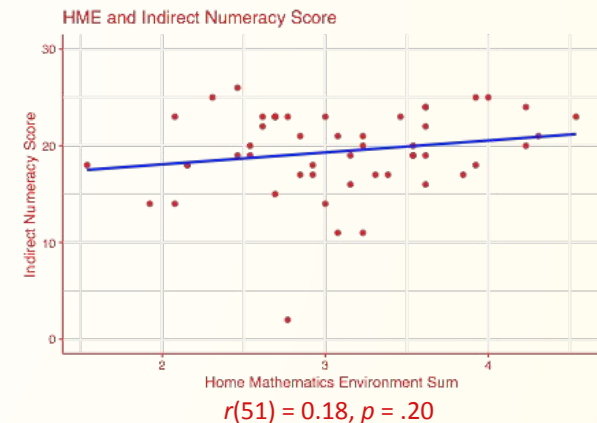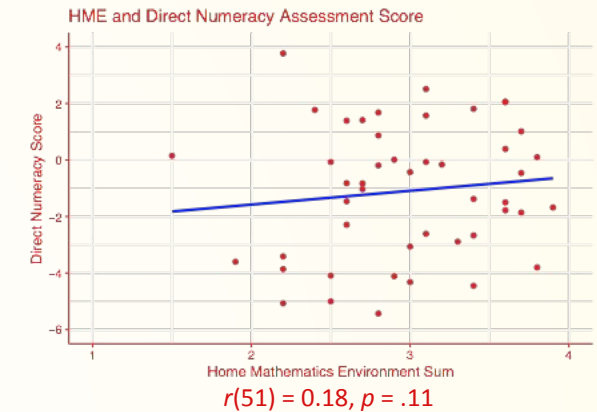
Conclusions
The HME did not differentially predict scores on the direct numeracy assessment or the indirect numeracy assessment. However, our study was limited by its small sample size, and limited measurement of the HME. Notably, the relation between the HME and both math assessments demonstrated small to moderate effect sizes (β = 0.13 and 0.17).

For questions, kapustkj@umich.edu, https://osf.io/v8cpt/