

A Vicious Loop? Longitudinal Relations Between Math Anxiety and Math Performance for Grade 2 and 3 Students



Shujie Song¹, Chang Xu¹, Jo-Anne LeFevre¹, Sheri-Lynn Skwarchuk², Erin Maloney³, Helena P. Osana⁴

¹Carleton University ²University of Winnipeg ³University of Ottawa ⁴Concordia University

Introduction

Math anxiety has been studied intensively in adults and adolescents. Consistent findings show that math anxiety may have a prolonged negative impact on people's career choices and everyday life experience. The focus has shifted toward young children to determine when and how math anxiety starts, but the findings are inconsistent. A bidirectional relation has been suggested (Gunderson et al., 2018), that math anxiety may be both the cause and the outcome of poor math abilities.

Hypotheses:

1. Math anxiety is correlated with math performances (e.g., symbolic number comparison, mathematical problem solving, and arithmetic fluency) in both grade 2 and grade 3.
2. There is a reciprocal relation between children's math anxiety and math performance from grade 2 to grade 3.

Method

Participants:

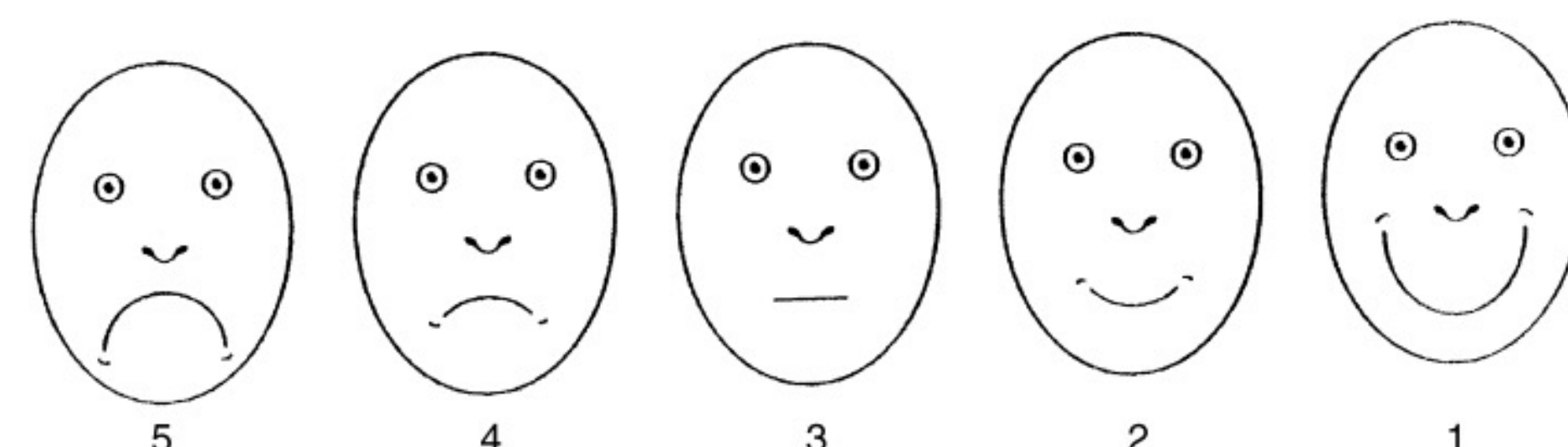
- 147 children in Winnipeg (63 boys; $M_{age} = 94.05$ months; $SD = 3.40$)
- Measured in both grade 2 and grade 3

Math Measures:

- Number Comparison
- Key Math Problem Solving
- Arithmetic Fluency: Addition & Subtraction

Children's Anxiety in Math Scale (Jameson, 2013):

- 16 items with 5 smiley face Likert scales



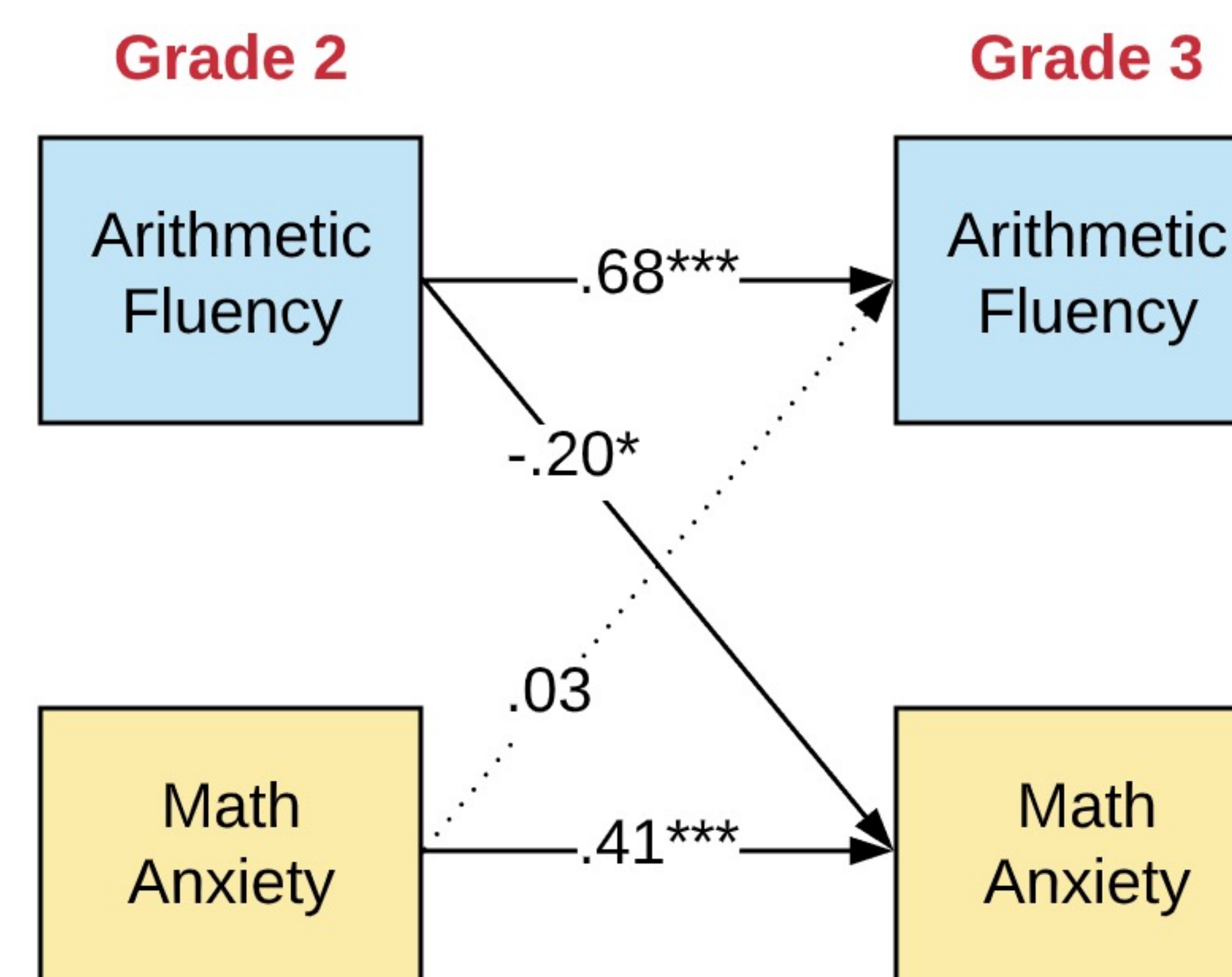
Correlational Analysis

Correlational Analysis

	1	2	3	4	5	6	7
1.Num Comparison Grade 2 ^b	-						
2.Num Comparison Grade 3 ^b	.61**	-					
3. Problem Solving Grade 2 ^a	.23**	.30**	-				
4. Problem Solving Grade 3 ^a	.26**	.32**	.63**	-			
5. Arithmetic Fluency Grade 2 ^a	.49**	.42**	.47**	.40**	-		
6. Arithmetic Fluency Grade 3 ^a	.46**	.53**	.45**	.40**	.63**	-	
7. Math Anxiety Grade 2 ^a	-.02	-.01	-.07	-.10	-.22**	-.17*	-
8. Math Anxiety Grade 3 ^a	-.12	-.07	-.04	-.01	-.26**	-.12	.49**

Note. ^a. Total correct. ^b. Rate (Mean accuracy/Mean response time). ^c. Factor score based on PCA. * $p < .05$. ** $p < .01$.

Cross-Lagged Regression



Note: Numbers on the arrows represent the standardized beta coefficients for the unique relations. Solid lines represent significant relations, whereas the dashed line represents non-significant relation. *** $p < .001$, * $p < .05$.

Discussion

- Math anxiety is correlated with arithmetic fluency and not with other math outcome variables; but this relation is weak in lower grades of elementary school.
- Both math anxiety and arithmetic fluency significantly increased from grade 2 to grade 3.
- Children's arithmetic fluency in grade 2 predicted the change in children's math anxiety from grades 2 to 3, but not vice versa.

Acknowledgements

Thanks to the *Winnipeg research team* and all the parents, teachers and children of the school division (Louis Riel SD and Seine River SD). And also thanks to the *Ottawa research team*: Stephanie Hadden, Heather Douglas, Jill Turner, Renee Whittaker and Sarah Macintosh.