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Predictors of Math Anxiety in Elementary School Kids

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Predictors of Math Performance in Elementary School Kids

Carly Bernstein '21, Julia Orlov '21

Introduction

Pre Existing Research

- Understanding of rational numbers is a key indicator of future math achievement (Park, S. & Esposito, A. (2021))
- Past studies have found a negative correlation between math anxiety and math achievement.
- Math anxiety has been linked to a conscious avoidance of numerical based tasks (Krinzinger et al. 2009).
- Gender differences in math anxiety are present by the first grade, and possibly earlier (Lauer, Esposito, & Bauer 2019).
- Dr. Carol Dweck pioneered the concept of a growth mindset
- Growth activity: inspired by Dweck's growth mindset affirmations, immediately followed Ramirez et al.'s anxiety scale.

Research question

- Do grade and math anxiety predict math achievement?
- Do grade and math anxiety predict rational number conceptualization (Math SpAM performance)?
- Is math anxiety the mediator between gender and math achievement?

Method

Participant Pool

The participant population was made up of 2nd-5th grade students aged 8-10 (M age = 10.02, SD age = .62, 3 females)

Spatial Arrangement Method (SpAM) Task (IV)

"Put the stickers that you think go together close and the stickers that are different from each other far apart"

- Notation:
 $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{6}$
 - Quantity:
 $\frac{1}{2}$, $\frac{2}{4}$, 0.5

STAR Math Task (IV)

A series of standardized mathematics problems at the third grade level.

Anxiety Scale (DV)

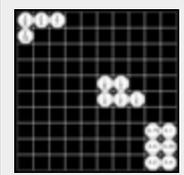
Eight reflective prompts on math anxiety measured on a scale of 0-100: "How do you feel when you have to take a big test in your math class?"

Grow-ga Debriefing

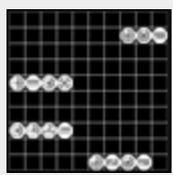
Call-and-response activity using physical movements and positive affirmations. Based off of research about growth mindset activities aiding in learning.

Results

Rational Number Conceptualization



" $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{6}$ " →
Code for Notation



" $\frac{1}{2}$, $\frac{2}{4}$, 0.5 " →
Code for Quantity

Mediation Analysis: Is math anxiety a mediator in the relation between gender and math achievement? Do female students with higher math anxiety have lower math achievement?
 - Gender was not a predictor in math anxiety or achievement so we could not look at the mediation analysis.

Regression Analysis 1: Is math anxiety a predictor of the Number SpAM task?
 - Grade and math anxiety did not significantly predict children's conceptualization of rational numbers, meaning we could not predict the organization on the SpAM task based on participant grade or math anxiety score.

Regression Analysis 2: Is math anxiety a predictor in math achievement?
 - Grade, but not math anxiety, significantly predicted math achievement. See results in Table below.

	b	SE	t-value	p
Intercept	379.53	108.88	3.49	0.004
Grade	92.15	25.2	3.66	0.003
Math Anxiety	-0.71	0.98	-0.72	0.48
F(2, 13) = 7.77, p = 0.006, Adjusted R ² = 0.4745				

Discussion

- The amount of participants in our study directly impacted the power to find significant results in both the regression analyses and the mediation analysis
- More analysis is needed with a larger sample size.
- Math anxiety could not predict results for the number SpAM activity or math achievement
- It is important to consider that our participants came on a voluntary basis, and therefore were mostly math-confident students
- Participant's grade was statistically significant determinant of academic achievement
- This is fairly intuitive, as children expand their knowledge in each grade.
- Female-identifying participants displayed higher levels of math anxiety
- However, due to the small population of participants, we were unable to make a statistically significant conclusion
- Implication/Future Steps**
- This data should serve as a baseline for continued observation and data collection in order to determine if low power was the reason for non-significant results
- In observation, there was a change in demeanor from the Anxiety Scale task to the Grow-Ga activity, this could be an indication that physical movement paired with affirmations can alleviate some temporary stress.

Conclusions

- After completing the SpAM task, participants were asked to explain their thinking. Often times when the grid was coded as "Notation", the participant's explanation proved some understanding in quantitative organization strategies.
- Participants of ten times could verbally explain their organizational strategies in a clear manner.
- In the future, these data can help teachers be more weary of their personal biases in the classroom (Beilock et al. 2010) that may unknowingly impact their students' math anxiety and resultant achievement.
- Instituting curriculum-wide changes that include more growth-mindset activities to alleviate students' math anxiety.

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