# Reframing anxiety: How domain anxieties affect performance on cognitive tasks framed as domain-specific.

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## Background

Math anxiety is associated with underperformance in and avoidance of math and careers that involve math (Hembree, 1990; Dowker et al., 2016).

Creativity anxiety (i.e., anxiety specific to creative thinking) has recently been shown to exist across diverse content domains, affecting creative thinking and performance (Daker, Cortes, Lyons, and Green, 2019).

The Framing effect has been shown to impact decision making (Kühberger, 1998), metacognition (Finn, 2008) and performance (Steele-Johnson, & Kalinoski, 2014). This pilot looks to utilize framing effects to mitigate the negative impacts of math anxiety and creativity anxiety.

## Hypothesis

We hypothesized that individual differences in domain-specific anxiety would interact with instruction type such that individuals would perform worse when a task was described as relevant to their anxious domain and better when it was not.

## Procedure

In a separate study we measured math anxiety using the short Mathematics Anxiety Rating Scale (SMARS) and creativity anxiety using the Creativity Anxiety Scale (CAS).

Using these measurements, we selected the top quartile of math anxious participants and the top quartile of creative anxious participants to take part in the present study.

In this pilot we paired administration of three cognitive tasks not strongly tied to math or creativity, with instructions indicating that the task was either a Mathematical Ability Test, a Creative Ability test, or a Neutral task. Tasks and frames were counterbalanced across participants.

## Frames and Measures

### Frames:

You are about to begin the **Mathematical/ Creative Thinking Ability Task.**

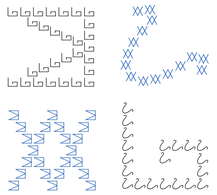
Recall that performance on the Mathematical/Creative Thinking Ability Task has been shown to reliably measure mathematical/creative thinking ability. In other words, those who are good at mathematical/creative thinking tend to do well on the Mathematical/Creative Thinking Ability Task while those who are not good at mathematical/creative thinking tend to do poorly on the Mathematical/Creative Thinking Ability Task.

You are about to begin the **Neutral Task**

Recall that this task is often used in research, but it is not meant to measure any specific cognitive ability. Performance on the Neutral Task is not related to either math or creative thinking ability.

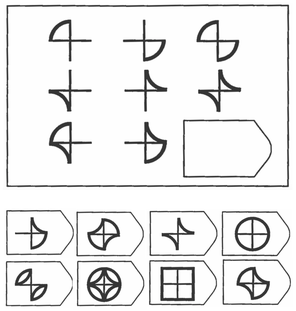
### Measures:

#### Visual Stroop/ Local Global task



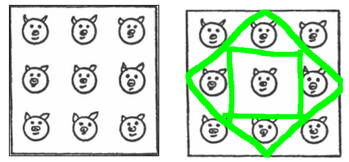
If the color of the symbols are **BLACK**, respond based on what the BIG symbol is. If the color of the symbols are **BLUE** respond based on what the SMALL symbols are.

#### Ravens Advanced Progressive Matrices



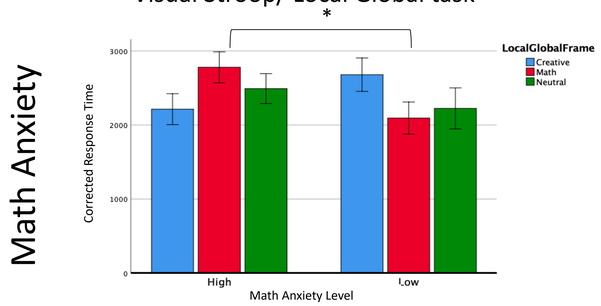
#### Insight Task (Pig Penn Problem)

Nine pigs are kept in a square pen (below, left). Build two more square enclosures that would put each pig in a pen by itself. (Answer on right)



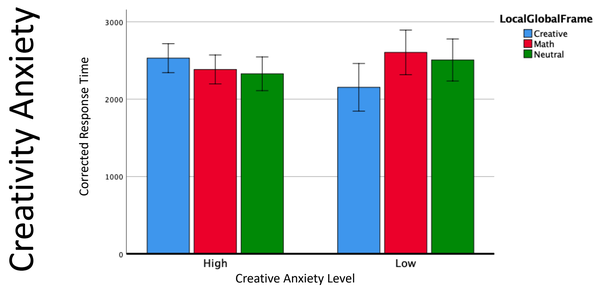
## Results

### Visual Stroop/ Local Global task



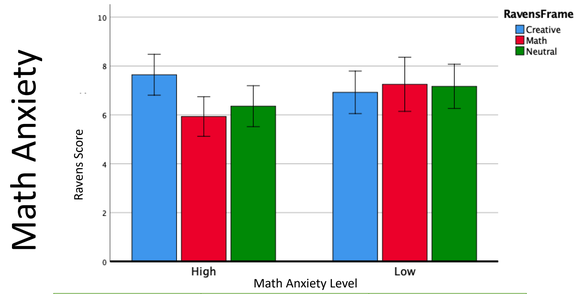

| | F | p |
|---|---|---|
| Local Global Frame | .087 | .917 |
| Math Anxiety | .781 | .380 |
| Local Global Frame * Math Anxiety | 3.652 | **.031** |

* Math Anxiety x Math Frame $t(25) = -2.304.1$, $p = .03$

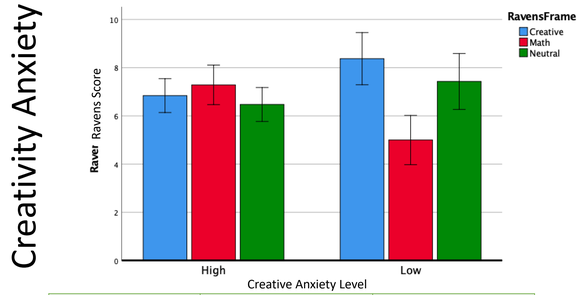



| | F | p |
|---|---|---|
| Local Global Frame | .189 | .828 |
| Creative Anxiety | .001 | .971 |
| Local Global Frame * Creative Anxiety | .882 | .419 |

### Ravens Advanced Progressive Matrices

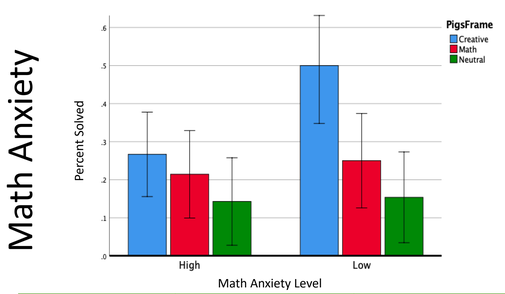



| | F | p |
|---|---|---|
| Ravens Frame | .327 | .722 |
| Math Anxiety | .407 | .526 |
| Ravens Frame * Math Anxiety | .709 | .496 |

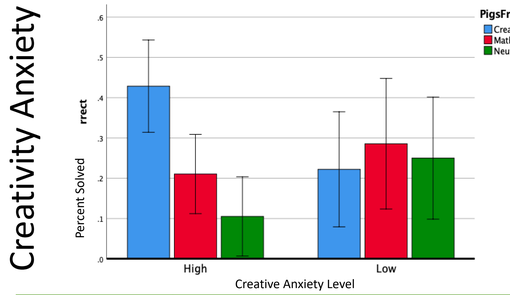



| | F | p |
|---|---|---|
| Ravens Frame | 1.273 | .286 |
| Creative Anxiety | .008 | .930 |
| Ravens Frame * Creative Anxiety | 2.472 | .092 |

### Insight Task (Pig Penn Problem)




| | F | p |
|---|---|---|
| Insight Frame | 1.772 | .178 |
| Math Anxiety | .857 | .358 |
| Insight Frame * Math Anxiety | .452 | .638 |




| | F | p |
|---|---|---|
| Insight Frame | .660 | .520 |
| Creative Anxiety | .002 | .966 |
| Insight Frame * Creative Anxiety | 1.034 | .361 |

## Conclusions

**Ravens:** There were no significant results but this is not surprising given the small sample size. However, results are trending in the right direction; those with low levels of a domain anxiety are tending to perform better than those with high levels of that domain anxiety when the task is framed as being related to that domain.

**Local Global**: Those with high math anxiety perform worse on Local Global when it is framed as a Math task relative to both other frames and the low math anxiety group.

**Insight Problem**: There were no significant results but again this is not surprising given the small sample size. Unfortunately, the data is also difficult to interpret because of potential floor effects.

These preliminary findings suggest that, for some types of problems, it might be possible to ameliorate some of the negative performance effects associated with domain anxieties by reframing problems as being unrelated to the domain of an individual's anxiety.

## References

Daker, R. J., Cortes, R. A., Lyons, I. M., & Green, A. E. (2019). Creativity anxiety: Evidence for anxiety that is specific to creative thinking, from STEM to the arts. Journal of Experimental Psychology: General.

Dowker, A., Sarkar, A., & Looi, C. Y. (2016). Mathematics anxiety: What have we learned in 60 years?. Frontiers in psychology, 7, 508.

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Kühberger, A. (1998). The influence of framing on risky decisions: A meta-analysis. Organizational behavior and human decision processes, 75(1), 23-55.

Steele-Johnson, D., & Kalinoski, Z. T. (2014). Error framing effects on performance: Cognitive, motivational, and affective pathways. The Journal of psychology, 148(1), 93-111.