

# The Relationship Between Undergraduate Students' Mathematics Anxiety and Motivation to Learn Mathematics: A Mixed Method Study

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## Introduction

One of the most significant reasons students dislike mathematics is mathematics anxiety, an emotional component identified in the research (Shen, 2009).

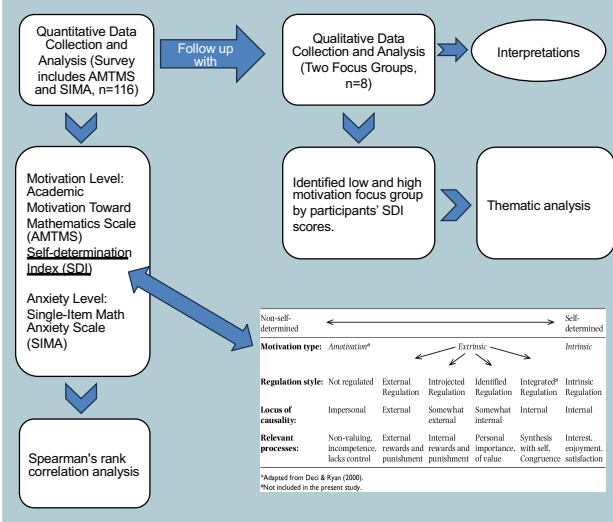
Motivation is an essential factor that affects students' creativity, learning styles, and academic achievement (Dilek et al., 2020).

There needs to be further research on the precise relationship between mathematics anxiety and motivation, further discovering the association between intrinsic or extrinsic motivation and math anxiety. (Dowker et al., 2016).

## Research Questions

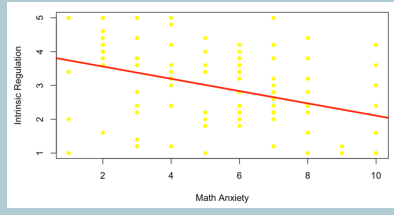
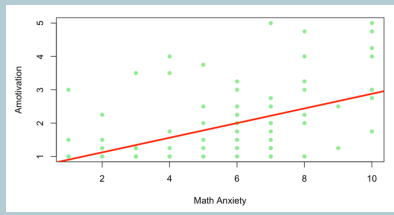
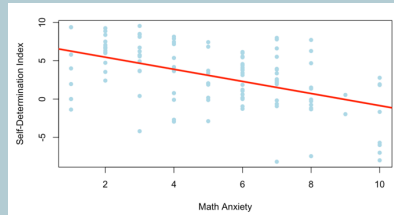
1. Is there a relationship between university students' mathematics anxiety and motivation to learn math?
- 1.1 What are students' attitudes and motivations towards math? How do the attitudes and motivations differ between students with low and high math motivation levels?
- 1.2 How do students perceive the relationships between their emotions towards math and motivation to learn math?

## Methodology



## Results

### Quantitative Results



### Qualitative Results

	Themes	
	High SDI Groups	Low SDI Groups
<b>Attitudes towards math</b>	1. In general, enjoyable 2. Overcome negative emotions eventually 3. Learnable	1. Negative emotions 2. Difficulty with math 3. Boring
<b>Motivation to learn math</b>	1. Help with the future 2. Intellectually motivated 3. Positive feedback on emotions	1. Math-related jobs 2. Compulsory 3. Lack of motivation
<b>Perception of Relationship</b>	1. Motivation influences emotions 2. Emotions influence motivation 3. Mutually influence	

## Discussion

### Quantitative Study

- A significant negative correlation was found between undergraduate students' math motivation level and math anxiety. This suggests that students tend to have lower math anxiety levels with greater levels of self-determination (more intrinsically motivated).
- Sub-scale amotivation showed the highest positive correlation, while intrinsic regulation showed the highest negative correlation with math anxiety.

The qualitative data analyses were in line with quantitative findings

### Qualitative Study

- Low self-determined groups exhibit amotivation and external regulation as their primary motivations for learning math. These groups have negative attitudes, experiencing emotions like anxiety and frustration, and perceive math as tedious and challenging.
- High self-determined groups express intrinsic regulation as their motivation, finding satisfaction, success, and fun in math. Despite occasional pressure and anxiety, they perceive math as an interesting and enjoyable subject that improves with practice.
- The focus groups also provide some insights into the relationships between students' attitudes and motivation in math.

## Limitations

A self-selection bias may have been present among participants, which refers to the bias when individuals can choose whether to participate in a research study (Hu et al., 2017).

Confirmative bias may occur in two focus groups, suggesting participants elicit a change in belief to fit into the social group.

The focus groups did not directly address math anxiety. This was intentional to avoid question bias, but it resulted in a limited discussion on the topic. While some participants mentioned their anxiety with math, there were no detailed illustrations, which may be a study limitation.

## Contribution

- addresses the gap in existing research by using a modified Academic Motivation Scale to analyse the relationship between motivation sub-scales and math anxiety
- potentially informs future research on the cause and effect of math anxiety and motivation.
- combines survey and focus groups to explore this topic, providing substantive quantitative and qualitative data to the related educational fields
- potentially helps educators to moderate students' math anxiety and motivation in the teaching process and develop teaching strategies and curricula that promote student achievement.

## Reference

Dilek, Ö., Çakiroğlu, Ö., & Yurtçu, S. (2020). Investigating the relationship between academic motivation and creativity of university students. *Journal of Education and Learning*, 9(3), 168-179.

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