# Mindfulness to Reduce Math Anxiety and Improve Math Performance

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# Literature Review

- Math Anxiety
  - Prevalent, especially for college students (Foley et al., 2017; Ramirez et al., 2018)
  - Negative impact on math performance and educational outcomes (Barroso et al., 2021)

- Mindfulness
  - Negatively related to math anxiety, positively related to math performance (David et al., 2021; Weed et al., 2021)
  - Psychological, cognitive, and academic impact (LaGue et al., 2019; Quach et al., 2016; Vorontsova-Wenger et al., 2021)
  - Benefits of embedding in the classroom (Samuel & Warner, 2021)

- Growth Mindset
  - Impacts motivation and academic outcomes (Yeager & Dweck, 2020)
  - Benefit of combined Mindfulness and Growth Mindset interventions (Samuel & Warner, 2021)

# The Present Study

- Gaps in the Literature:
  - Lack of studies evaluating video-based mindfulness and growth mindset intervention embedded in the classroom
  - Lack of studies investigating impact of mindfulness intervention on math performance in the class context

- Goal:
  - Inform relationship between mindfulness, math anxiety, and math performance
  - Investigate impact of intervention on mindfulness, math anxiety, math performance, and student experiences in the classroom
  - Evaluate an educational resource to address psychological and academic outcomes in the classroom

# Intervention

- One-minute video of mindful breathing exercises (Headspace, 2018)
- Recitation of positive affirmations (Samuel & Warner, 2021)
- Embedded in the classroom

# Research Questions

- What is the relationship between math anxiety, mindfulness, and math performance?
- What is the impact of the intervention on emotional aspects of mindfulness and math anxiety?
- What is the impact of the intervention on student grades in the class?
- What is the impact of the intervention on student experiences in the classroom?

# Participants

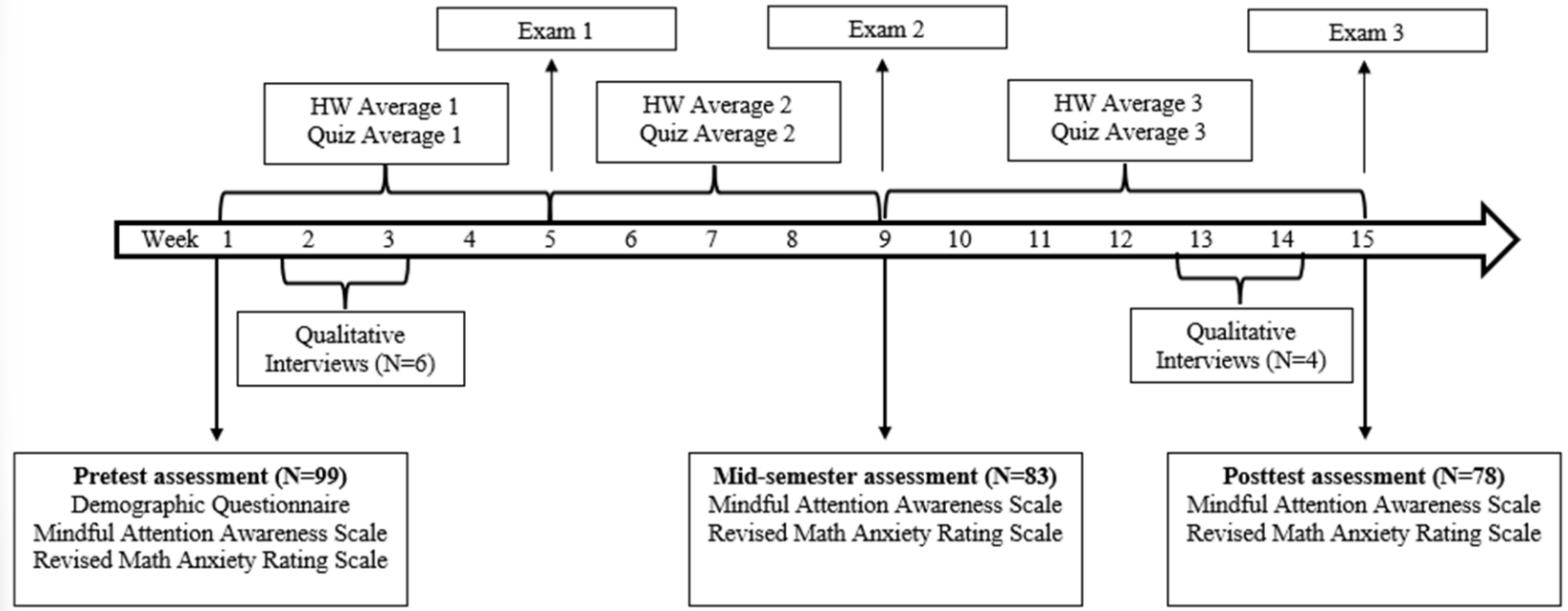
- $N$=99
- Qualifications
  - 18 years of age or older
  - Enrolled as a residential undergraduate student at Liberty University
  - Enrolled in a residential section of PSY 354 or PSY 355
- Compensation for Quantitative portion
  - 3 Psychology activity credits
  - Raffle
- Compensation for optional Qualitative portion
  - Raffle

# Methods

- Study design
  - Mixed methods
  - Quasi-experimental

- Measures
  - Demographic questionnaire
  - Mindful Attention Awareness Scale (MAAS)
  - Revised Math Anxiety Rating Scale (RMARS)
  - Teacher reported grades

# Methods




*HW - Homework

# Quantitative Analysis

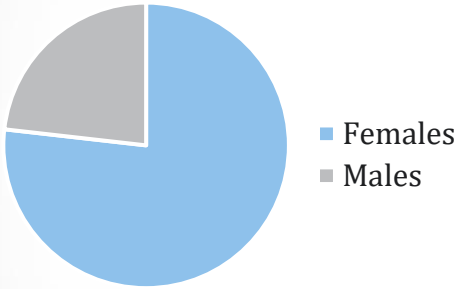
- Correlations
  - *Pretest Mindfulness, Math Anxiety, and Grades*
- Repeated measures ANOVAs and *t*-tests
  - *Mindfulness, Math Anxiety*
- Repeated measures ANCOVAs and *t*-tests
  - *Homework, Quizzes, Exams*
- ANCOVA
  - *Final Grade*
- Software
  - *SPSS Statistics 28.0*

# Qualitative Analysis

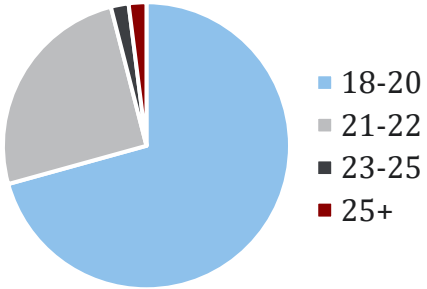
- Phenomenological
- Thematic Analysis
- Thematic Comparison

# Demographic Results

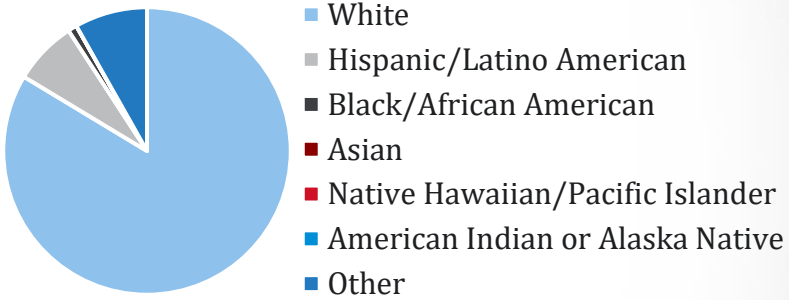
## Gender




## Age




## Race/Ethnicity



# Results – RQ 1

What is the relationship between math anxiety, mindfulness, and math performance?

**Impact of Age:**

Older students had

- Higher math anxiety
- Worse performance on Exam 1
- Worse final grade

**Impact of Gender:**

Females had

- Better performance on Homework 1
- Better performance on Quiz 1
- Better final grade

**Relationship between variables**

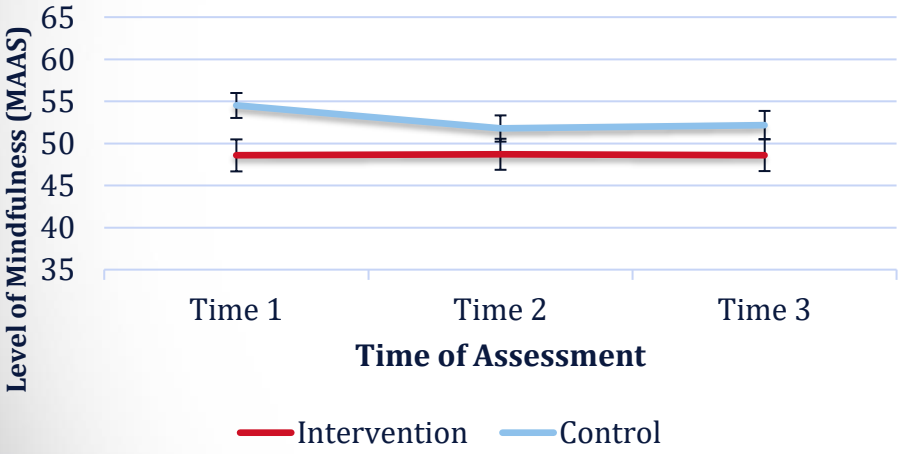
| Variable | *N* | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| **1.Math Anxiety** | 99 | -- | | | | | |
| **2. Mindfulness** | 99 | -.21* | -- | | | | |
| **3. Homework** | 87 | .01 | .13 | -- | | | |
| **4. Quiz** | 87 | -.20 | -.03 | .27* | -- | | |
| **5. Exam** | 87 | -.27* | .08 | .41** | .49** | -- | |
| **6. Final Grade** | 87 | -.26* | .14 | .72** | .60** | .68** | -- |

*$p$<.05. **$p$<.01.

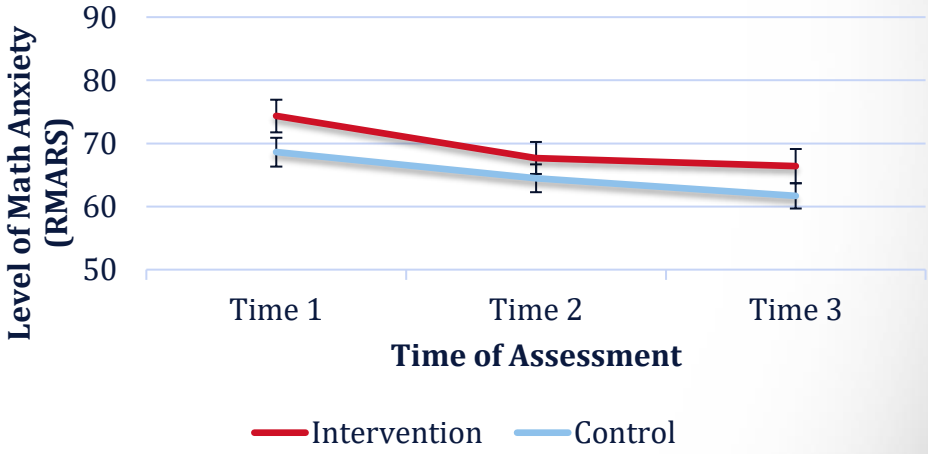
# Results – RQ 2

What is the impact of the intervention on emotional aspects of mindfulness and math anxiety?

## Progression of Mindfulness



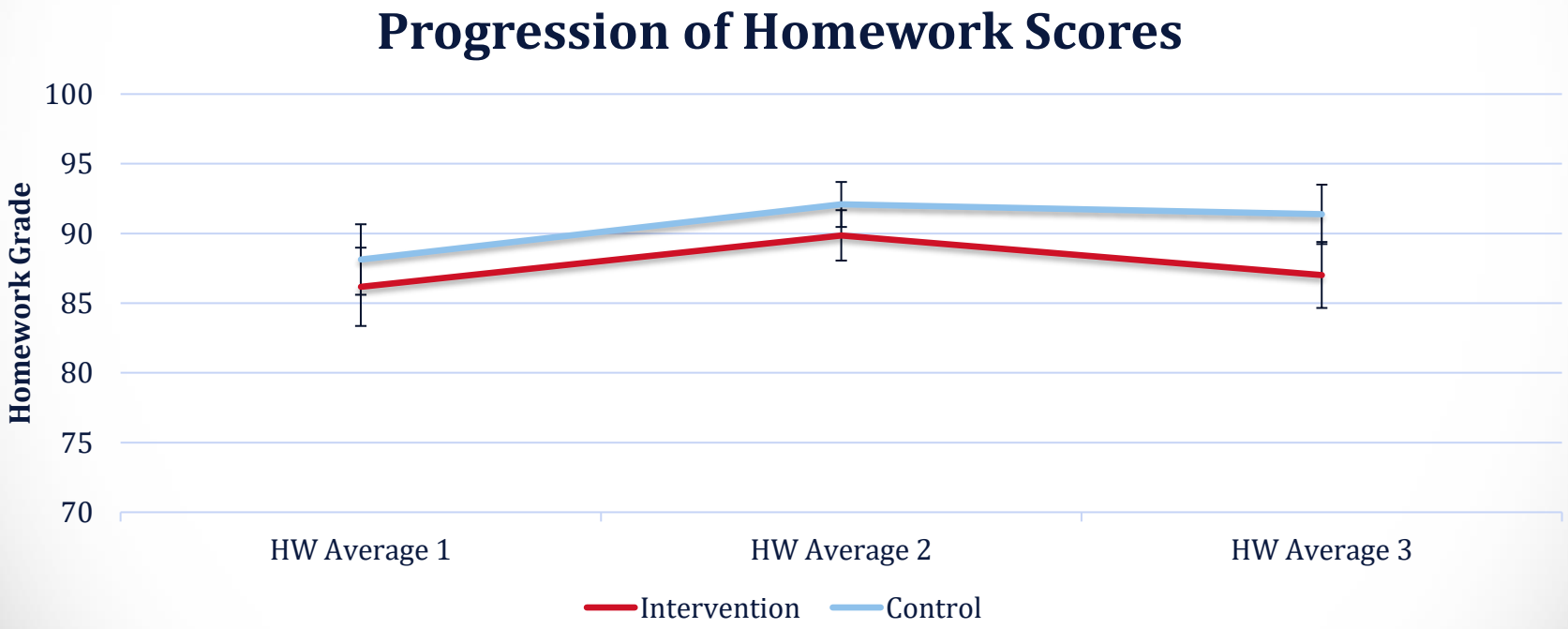

## Progression of Math Anxiety




Percent change in math anxiety correlated with self-reported engagement with the intervention ($r$=-.38, $p$<.001).

# Results – RQ 3

What is the impact of the intervention on student grades in the class?



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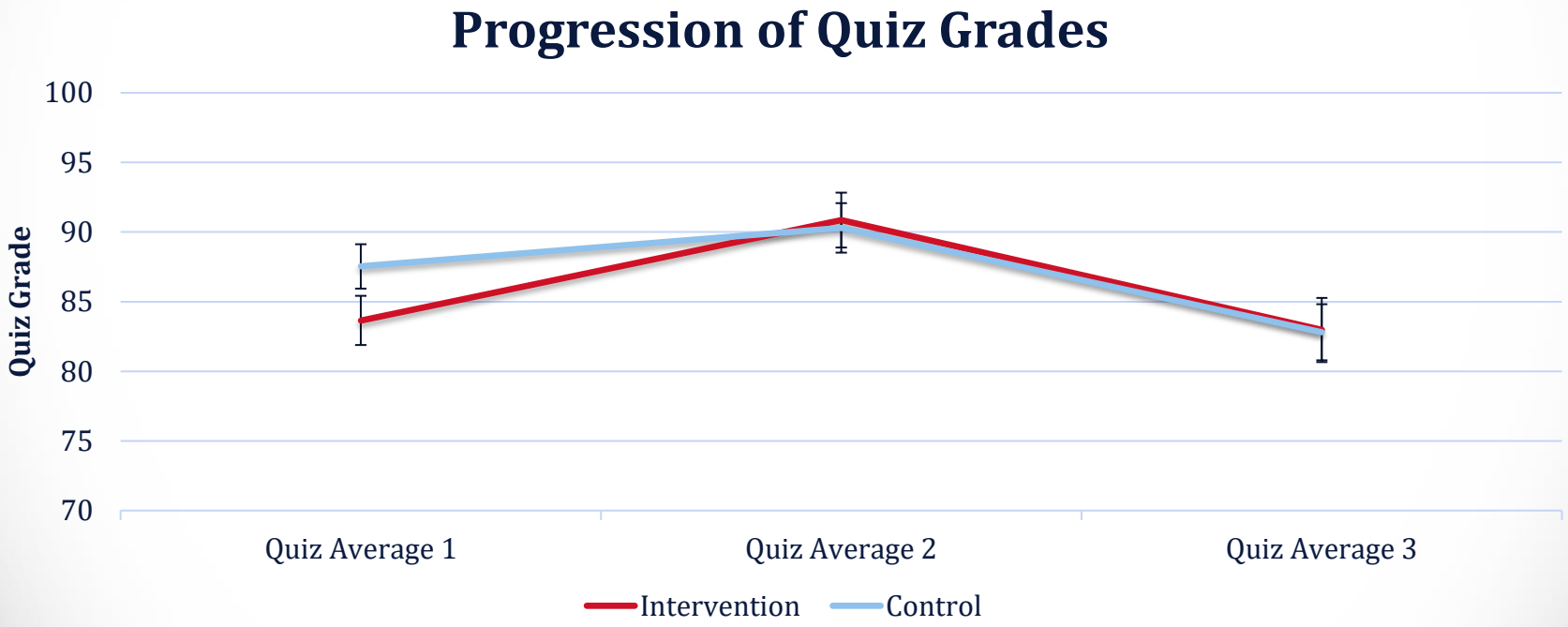

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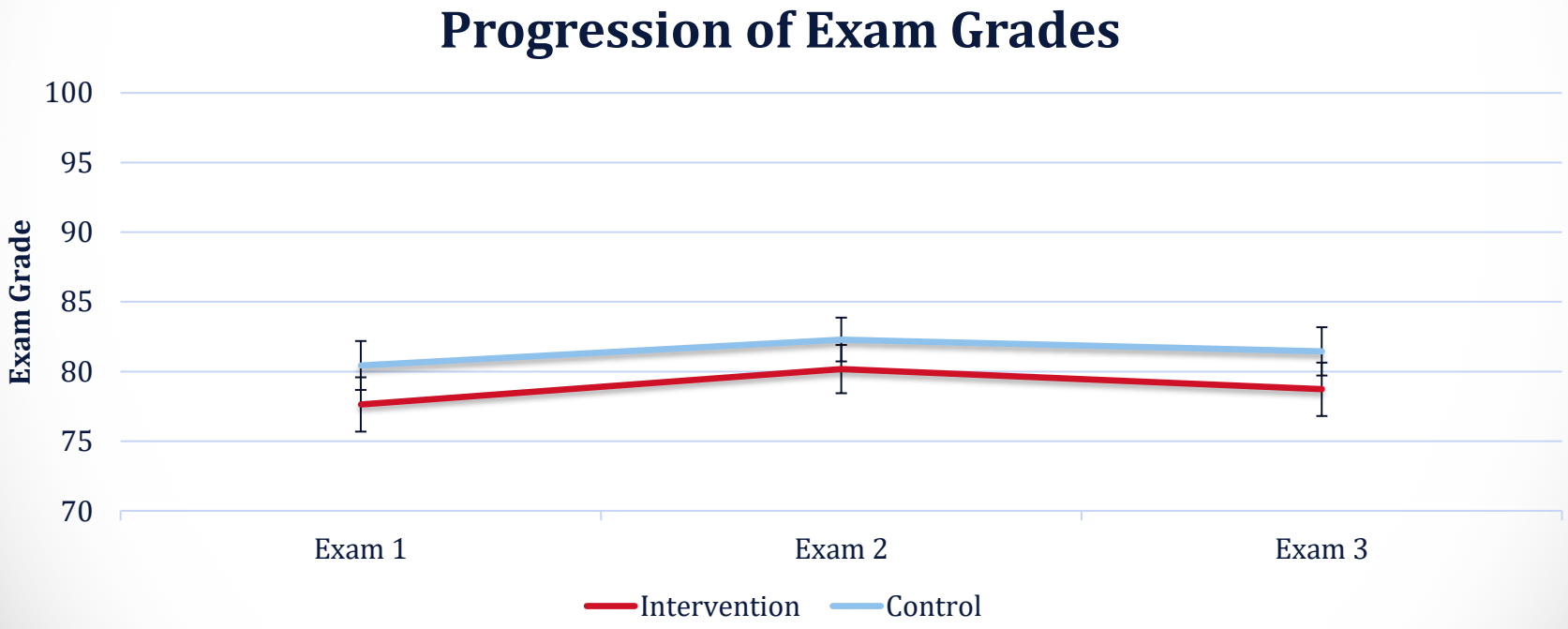

# Results – RQ 4

What is the impact of the intervention on student experiences in the classroom?

- Pretest Themes
  - Mindfulness as Emotional and Cognitive
  - Math Anxiety as Multifaceted in Nature and Impact
  - Success in the Course Contingent on Both External and Internal Factors
- Posttest Themes
  - Intervention Benefited Emotions
  - Intervention Prepared Class to Learn
  - Barriers to Intervention
- Posttest Comparison
  - Changes in Mindfulness
  - Changes in Math Anxiety
  - Perception of Statistics

# Discussion

- Limitations
  - Sample
  - Unequal classes
  - Individual randomization not possible

- Recommendations
  - Replication with larger sample
  - Expand to other academic disciplines

# Conclusion

- Mindfulness and growth mindset embedded in the classroom
  - Reduces math anxiety
  - Maintains mindfulness
  - Improves performance on moderate-stress assignments

- This research highlights an educational resource teachers can implement to address the socioemotional and academic needs of their students

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# Any Questions?

Thank you!

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