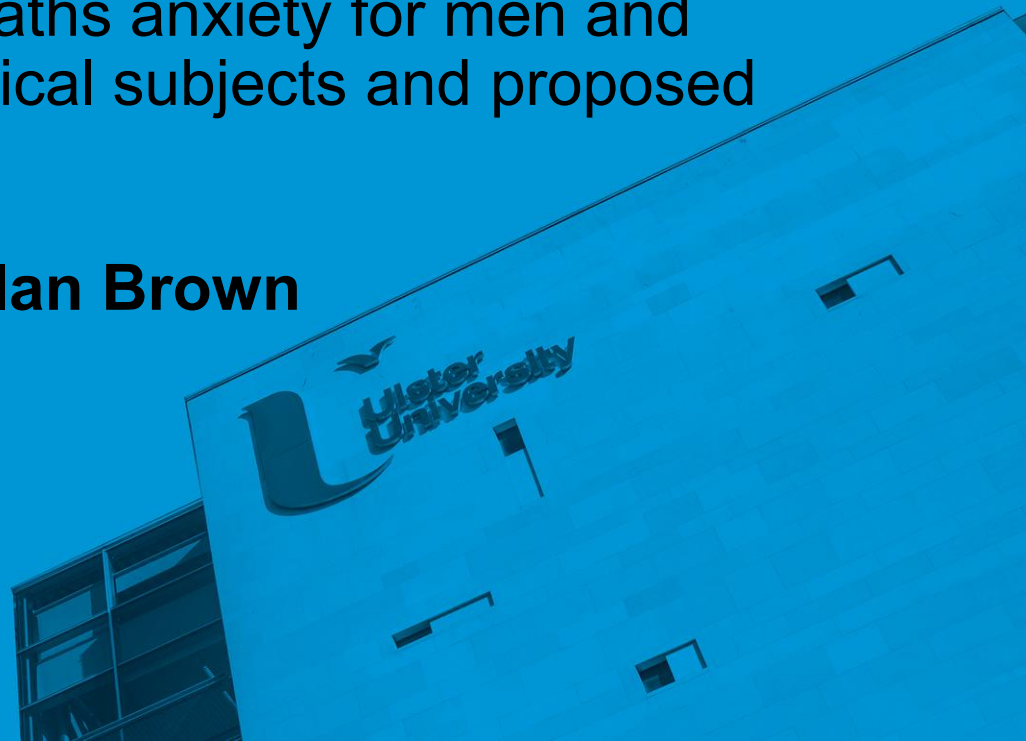
Identification of causes of maths anxiety for men and women in applied mathematical subjects and proposed practice-based mediations

Dr Louise Brown and Dr Alan Brown



Definition of maths anxiety

"feelings of tension and anxiety that interfere with the manipulation of numbers and solving mathematical problems in a wide variety of ordinary life and academic situations" (Richardson and Suinn,1972)

Literature findings

- Undisputed claims about MA including its distinctiveness, that it can be reliably measured through self-reporting in survey instruments and that it can be reduced (Cipora et al (2022).
- MA can be seen in neurological scans (Supekar et al, 2015) use fMRI scan evidence to show activity in amygdala.
- MA can result in physical symptoms ie pain (Lyons et al, 2012)
- MA can result in motivated forgetting (similar response seen with other trauma such as death, war) (Ramirez, 2017)
- MA can increase avoidance of more complex tasks (Harriss et al, 1984)

Maths anxiety exists- what do we do?

- Kirkland and Hunt (2025) suggested that a “one-size-fits-all” approach to Maths Anxiety interventions will be ineffective, as the experience differs for each maths anxious individual.

- Codding et al. (2023) found that therapeutic interventions had a greater effect on reducing Maths Anxiety. Conversely, the interventions that targeted Maths skills led to a greater improvement in Maths performance.

Rationale for the study

- Previous studies focus on maths at a primary or secondary level not often applied maths at tertiary level.

- From a practitioners' point of view if we do not identify, acknowledge and seek to address MA we may have issues of engagement, attendance and attainment.

- Early intervention is optimal and students could have 10+ years of MA.

- Mindfulness and growth mindset techniques can reduce MA – cheap and easy (Samuel et al, 2023)

- Validated survey instruments to measure MA such as MAS UK are effective (Hunt et al, 2011).

Aims of the Study

1. To measure the extent of maths anxiety amongst real estate and engineering students.

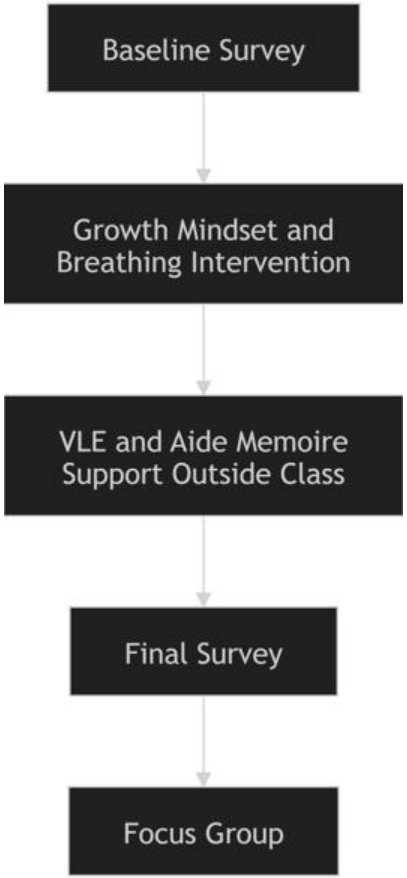
2. To introduce mindfulness and growth mindset activities (MAGMA) activities to reduce anxiety.

3. To survey students at the end of the semester to assess if intervention had been effective.

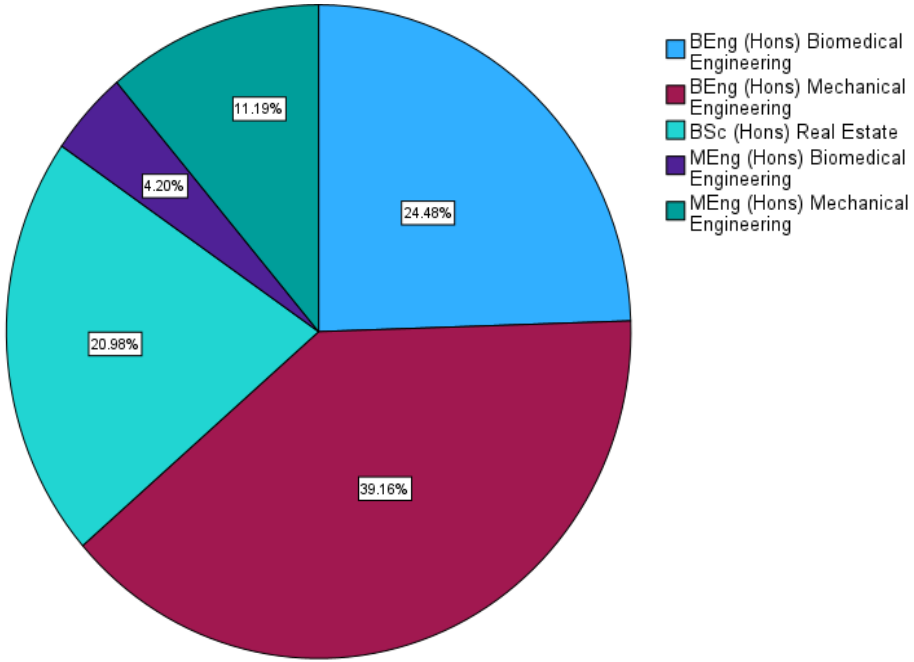
4. To propose alternative practice to mediate for anxiety inducing activities.

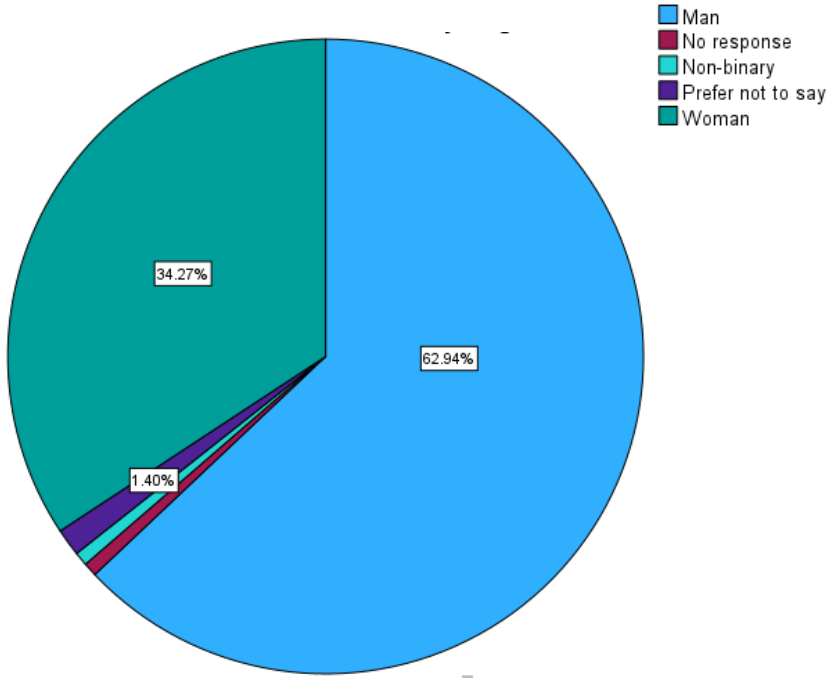
Methodological Approach

- Baseline test using Berlin Numeracy test (Cokely at al, 2012), MAS UK (Hunt et al,2011) and Growth mindset captured using 3 item scale (Dweck, 1999). Self reported.
- Interventions using Box breathing technique video and growth mindset statements (Dweck, 2006) displayed in class.
- Aide memoire and BBL resources for support outside class.
- Small focus group to capture student voice.



Respondent Profile (n=143)





BSc (Hons) Real Estate students - only 7% have A level and 80% have GCSE Mathematics as prior learning

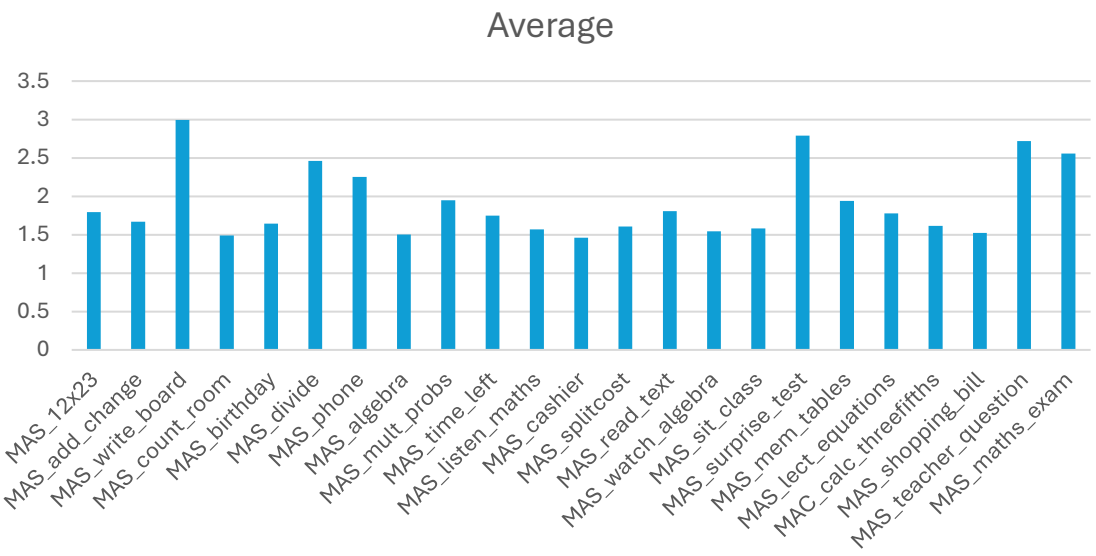
UK MAS Results

- Self reported validated survey
- Measured across 23 activities
- Uses a 5 point Likert scale (1 = not at all and 5= very much)

Average Maths Anxiety Results

MEng Biomedical Engineering (1.507)
MEng Mechanical Engineering (1.636)
BEng Mechanical Engineering (1.858)
BEng Biomedical Engineering (1.963)
BSc Hons Real Estate (2.031) = Slightly

Levels of MA by activity



<u>Highest anxiety tasks (self reported)</u>

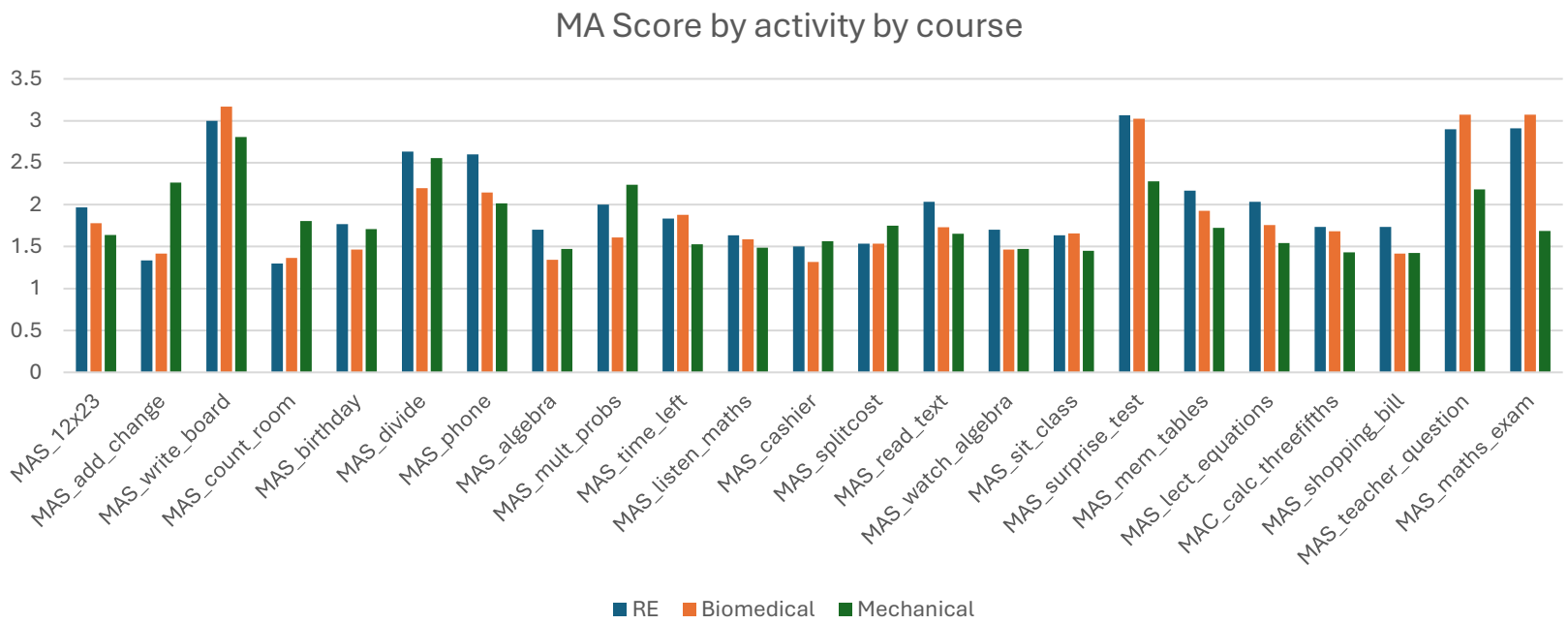
3) writing an answer to a problem on the board in front of the class

17) surprise maths test in class

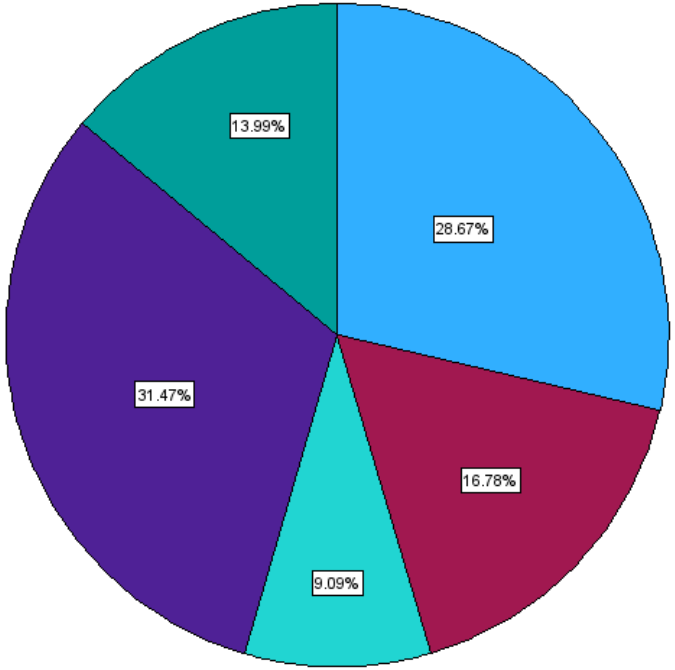
22) being asked a maths question by a teacher in class

23) maths exam

Maths anxiety scores by activity by course



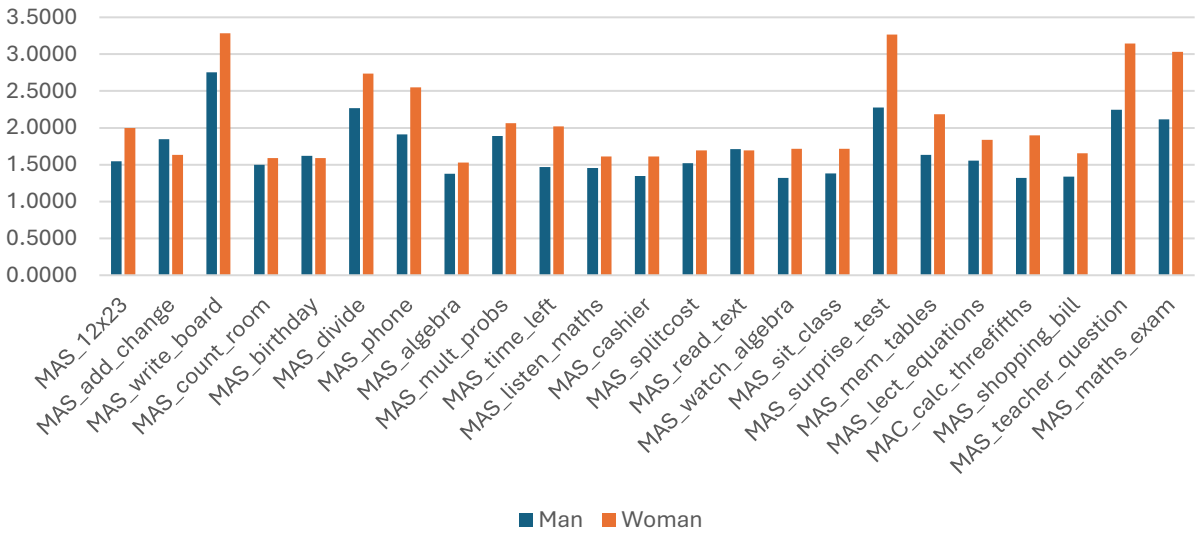
How anxious would you feel being asked to write an answer on the board at the front of a maths class ?



59 % of students experience anxiety (a fair amount to very much).

Increases to 73.3% for real estate students.

Level of MA by activity by gender



Females are more anxious than their male counterparts across all scenarios except adding up a pile of change.

Comparison with existing literature findings

Samuel and Warner (2021) and Hunt et al (2011) found that maths anxiety was higher amongst female participants this is also our finding.

Hunt et al (2011) average score on MAS-UK (38 items) was 2.07 compared to 2.03 for BSc Hons Real Estate students.

Focus Group Findings

Negative	Positive
• Described feeling ‘on edge’ • Anxiety increases if they feel ‘judged’ • Some students skipped class because of their feelings. • Individual work at home can be worse	• A relaxed atmosphere • Checking understanding individually. • Allowing students to make mistakes. • Small group tasks in class • Peer explanations • Chatting though concerns with friends. • More likely to persevere in a group • Growth mindset statements • Box breathing as a wider strategy but need reminded

Overall more statements about confidence and less about competence, strong focus on peer support and educator attitude and creating an open, safe learning space.

Emotional language used in focus group around maths anxiety

anxious

scared

awful

overwhelmed

uncomfortable

embarrassed

lost

stressed

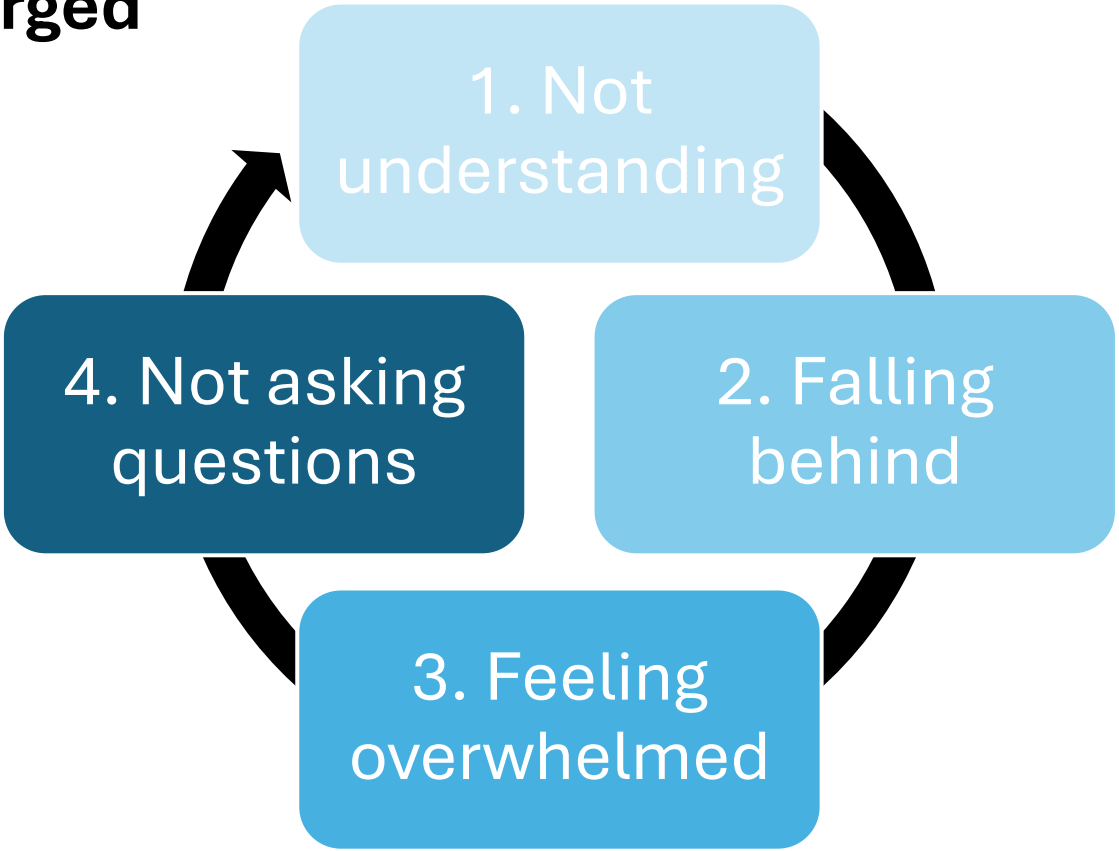
confident

relaxed

comfortable

supported

Pattern emerged



Alternative practice to enable learning

Instead of a writing an answer on the whiteboard and surprise testing

- Online quizzing, visualizer for sharing common errors and best practice examples anonymised.

Instead of calling on questioning

- Pen and paper (avoiding phones) in group tasks and use of DIRT.



Building confidence and mediating anxiety

- Addressing competence and confidence as conceptually different.
- Teaching breathing as a reset.
- Growth mindset statements as normal as part of our ethos.
- Rethinking timing, focus on accuracy and understanding rather than volume.



Staff Development

- Raising awareness amongst teaching staff of perceived immediacy and maths anxiety as concepts.

Next Steps……

- A more extensive study across a variety of courses.
- Trialing other mediations.
- A deeper study on the impact of interventions by gender (focus group)
- Studying the anomalies and those who may gain the most from intervention.
- Building a toolkit for staff development around maths anxiety.

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