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Abstracts

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Contents

Keynote: Professor Dénes Szűcs, Cognitive Neuroscience of Mathematics Anxiety

Many people are afraid of mathematics. Mathematics anxiety (MA) is “a feeling of tension and anxiety that interferes with the manipulation of numbers and the solving of mathematical problems in … ordinary life and academic situations” (Richardson and Suinn, 1972). I will present our large studies of MA. First, we have shown that MA is not a consequence of being weak in maths. While mathematically underperforming students have about double the chance to have high MA than other students, about 80% of students with high MA are normal to high maths achievers. Further, we have repeatedly found that females report notably higher levels of MA than males. These findings confirm to international data reflecting clear gender discrepancy even when females perform at about the same or higher levels than males in mathematics. Gender differences may manifest for several reasons. Finally, in an analysis of OECD data from more than 150,000 adolescents we have shown that MA is much less related to actual mathematics performance than to subjective perceptions of success expectancy in mathematics, perceived control over maths activities and the subjective value of mathematics. Understanding and managing students’ subjective self-perceptions may be key to preventing and alleviating MA.

Mathematics Anxiety as a Global Challenge: Research and Innovation

Dr Meena Mehta Kotecha, PhD (Cantab), MA, BA Hons, BSc Hons, PGCertHE (RSS), CMath, FHEA, Fellow of the RSS
m.kotecha1@lse.ac.uk

Researchers have been examining mathematics anxiety for more than 70 years. Yet mathematics anxiety continues to attract the attention of researchers worldwide. Gough (1954) was the first educator to use the term 'mathemaphobia' to acknowledge and describe her students' emotional difficulties with the subject. Since this seminal work, successive decades of research have reinforced the view that learners' affective responses to mathematics play a critical role in shaping their engagement with the subject. Thus, mathematics anxiety is a multidimensional phenomenon, and its sufferers generally report experiencing negative emotions accompanied by various physiological reactions when they encounter mathematics. These emotional and physiological reactions disrupt their cognitive abilities to perform operations that involve mathematical applications. Mathematics anxiety generates a widespread pattern of avoidance of mathematics, which contributes to a shortage of STEM skills around the world and has an adverse impact on the global economy. On that account, it is an issue of international concern.

Researchers are in accord on the ultimate consequence of mathematics anxiety, which is underperformance or failure for its sufferers (OECD, PISA, 2014, 2016, 2023, 2024). This can influence its sufferers' academic progression and future career choices. Moreover, past research indicates that students develop mathematics anxiety because of their unpleasant learning experiences of the subject. This has been highlighted as the main precursor of mathematics anxiety. This interactive talk will reveal new research-informed insights into mathematics anxiety and the impact of a pedagogical intervention that was evaluated using a multi-mixed methods research approach (Mehta Kotecha, 2026). It will present an original overarching theoretical framework that underpinned the research and the pedagogical intervention designed to moderate mathematics anxiety in university non-specialists.

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Statistics as Ritualised Calculation: How Cookbook Teaching Fuels Anxiety and Undermines Conceptual Understanding

Cedric E. Ginestet, PhD
Department of Biostatistics and Health Informatics,
Institute of Psychiatry, Psychology and Neuroscience,
King's College London
cedric.ginestet@kcl.ac.uk

Despite its centrality to contemporary scientific reasoning, statistics is widely experienced by students as opaque, anxiety-provoking, and conceptually alien. We argue that such anxiety is not an inevitable consequence of mathematical difficulty, but rather a predictable outcome of how statistics is commonly taught. Drawing on work from statistics education, cognitive psychology, and the philosophy of inference, we argue that procedural and counter-intuitive pedagogies, often described as "cookbook" approaches, systematically undermine conceptual understanding and exacerbate learners' anxiety (Cobb, 2011; Gelman & Stern, 2006).

Traditional statistics instruction prioritises formal hypothesis testing, symbolic manipulation, and rigid decision rules (e.g., p-value thresholds, and the 10 events-per-variable rule in regression), while giving limited attention to intuitive reasoning about uncertainty, variability, and modelling assumptions. From a cognitive perspective, this creates a dissonance between natural human reasoning and rigorous statistical inference. Research by Gigerenzer and Hoffrage (1995) has demonstrated that probabilistic reasoning improves markedly when problems are expressed in terms of natural frequencies rather than as conditional probabilities, suggesting that students' difficulties often stem from representational choices rather than mathematical ineptitude. Similarly, critiques of null-hypothesis significance testing argue that students are trained to perform ritualised procedures rather than engage in substantive inferential reasoning (McCloskey & Ziliak, 2008).

Recent work reinforces these concerns by demonstrating strong links between instructional design, student attitudes, and statistics anxiety. Empirical studies have shown that anxiety is exacerbated by opaque, rule-based teaching and mitigated by pedagogies that emphasise conceptual understanding, active engagement, and contextualised data analysis (Bamdad, 2025; Korolkiewicz, 2025). Technology-enhanced and project-based approaches have likewise been shown to improve attitudes toward statistics and reduce affective barriers to learning (Cujba & Pifarré, 2024).

Following Wild et al., 2011, we will present an alternative pedagogical orientation grounded in simulation-based inference, visual reasoning, and conceptual coherence. By foregrounding uncertainty, modelling assumptions, and interpretation, statistics can be reframed as a form of structured reasoning rather than ritualised calculation—an approach with the potential to improve understanding while substantially reducing student anxiety.

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Keynote: Professor Neil H. Spencer, Addressing Mathematics Anxiety in Higher and Continuing Education: Insights From a 30+ Year Career and Implications of the Emerging Role of AI

This talk will review the speaker's 30+ years teaching mathematical and statistical methods in Higher and Continuing Education, discussing the tools, techniques and initiatives he has used to combat mathematics anxiety in learners, from undergraduate and taught postgraduate students to doctoral researchers and workplace training course delegates. Technological tools which will be discussed include the use of authentic-type assessments, individualised datasets, computer-generated and computer-marked tutorial sheets and approaches designed to minimise or avoid the use of exams and in-class tests.

The talk will also explore how pedagogies can - and should - be adapted for learners operating at different levels and having different programmes of study or learning requirements. This includes addressing a range of learner needs, from "You've got to know this, so let's go through it in a way that guarantees you get there" through "The detail of this might be useful in the future, but to start with let's just get the basic idea sorted" and "This might be interesting and help you understand, but if it doesn't then, trust me, you can pretend I'm not talking" to "Yes, there is mathematics and equations behind all this, but I promise you don't need to worry about that."

To conclude, we discuss the challenges and opportunities that Artificial Intelligence (AI) is bringing to the issue of learner anxiety in the teaching of mathematical and statistical methods in Higher and Continuing Education. It is already clear that the future will differ significantly from the present and recent past - but how can we, as educators, ensure that our learners find themselves experiencing less anxiety?

Nurturing resourceful, resilient and confident learners: a pedagogical model for teaching mathematics at school level

Charlie Gilderdale cfg21@cam.ac.uk
Liz Woodham emp1001@cam.ac.uk
NRICH Project, Cambridge University

Relates to conference theme: 'Interventions and support strategies: Pedagogical innovations and instructional methods'

Charlie and Liz work for the internationally renowned NRICH project (https://nrich.maths.org), which provides free rich mathematical curriculum-linked tasks for teachers aiming to encourage students to work and think like mathematicians.

Traditional 'path smoothing' models of teaching (Wigley), though well intentioned, lead to students describing their experience of learning mathematics as TIRED: Tedious, Isolated, requiring Rote learning, Elitist and Depersonalised (Nardi). In these classrooms, the students' role is to imitate and replicate what has been demonstrated by the teacher and often lead to instrumental understanding, where students know what to do but do not know why, rather than relational understanding, where students know what to do and can explain why (Skemp). Students are put into a position in which success is measured by their ability to answer questions quickly and without errors. This often leads to students believing that they do not have a required 'mathematical gene', and feelings of anxiety, borne out by the findings of a survey commissioned by the Maths Anxiety Trust, in which 36% of 15-24 year-olds have felt anxious about mathematics.

What is the alternative?

NRICH offers a model that acknowledges the importance of providing a secure environment in which all students feel they can make progress (Dweck), while recognising the value of learning from struggle (SanGiovanni et al.). Productive struggle requires students to be resourceful and resilient, and recognise that making mistakes can be a springboard to learning (Nottingham). It may involve students exploring, conjecturing, testing and discussing ideas, and sharing alternative representations, before reaching solutions that they can explain and justify. These are the mathematical behaviours that we want to promote in our anxiety-free classrooms, where students work as part of a mathematical community (Johnston-Wilder and Lee).

In our session, we will demonstrate what this might look like in practice

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Review of Literature on Mathematical Anxiety in Undergraduate Students of Mathematics

Ric Crossman

Mathematically able graduates are essential to the UK economy, with 13% of UK jobs requiring "tools and techniques derived from research in the mathematical sciences" (AMS, 2023). Despite this, we have insufficient mathematics graduates to meet demand, particularly in education (NFER, 2024). Accordingly, work has been focussed on the UK mathematical pipeline (Noyes et al, 2023), but often this work excludes post-enrolment university education. We also must consider "disillusion and disengagement… and alienation from maths itself "(Croft & Grove, 2015) among mathematics undergraduates.

Doing this effectively is an ongoing concern. One under-considered aspect is the presence of mathematics anxiety (MA) among mathematics undergraduate students. Studies show (Pawley, 2025) MA exists among newly-arrived UK 1st year UG maths students. This anxiety may persist throughout an undergraduate degree and be associated with reduced academic performance (Juniati & Budayasa, 2020). These results need further exploration in the UK context. In particular, the possibility of increased MA over time, as students lose their earlier comfort with and sense of achievement in maths (Croft and Gove, 2015) and they potentially fall into cycles of suboptimal academic practice (Jenifer et al, 2023), requires study.

A related consideration is the concept of mathematical resilience (MR) (Kooken et al, 2013), the ability to maintain a positive, pragmatic stance regarding mathematical learning when encountering difficulty. At present, the relationship between MA and MR is uncertain – both positive (Gokhool, 2023) and negative correlations (Turgut, 2024) have been found. The possibility maths undergraduate students may never have needed to develop their MR and may therefore be surprising vulnerable to MA, needs attention.

In this presentation, I will summarise the current evidence for the presence of MA in UG mathematics students, how this relates to MR, disengagement and suboptimal academic practice, and map out a route for further work in this space.

Keywords

Mathematics anxiety, mathematical resilience, undergraduate mathematics students, transition to university

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Sue Pawley, *Recognising and Responding to Maths Anxiety in Higher Education*, 2025, Teaching of Mathematics Online (TALMO), online talk

Segat Turgut and Mahir Ugurlu, A moderated mediation analysis on the relationship between metacognition and mathematical resilience of gifted students, 2024, *Psychology in the Schools* 61 (5)

‘I’m not really a maths person but…’ A Work-in Progress Mixed Methods Study of Maths Anxiety Among Post-16 GCSE Maths Resit Students in a Sixth Form College.

Christopher Lewoski

In England, students without a passing grade 4 or higher in mathematics GCSE are required to continue studying the subject post-16. Many students experience repeated failure to secure this high-stakes qualification, and may consider difficulties with maths acquisition as an inherent deficit. Of the 200,000 resit students entering GCSE maths exams in 2025, only 20% attained grade 4 or above. Research on maths anxiety as a factor within this cohort remains limited.

The study explores maths anxiety as a dynamic construct, both influencing outcomes and influenced by affect, motivation and perceived competence. Primarily drawing on Pekrun’s Control-Value ideas, changes to self-efficacy judgements (Bandura), motivation and self-protection strategies (Covington) are explored as mediating the relationship between maths anxiety and acquisition of maths skills and knowledge.

This work-in-progress mixed methods study is based in a large Sixth Form college. It combines a longitudinal element using validated, self-reported survey instruments at three time points in the academic year, targeting the full maths resit cohort (n=150+), to capture changes in affect and maths anxiety over time. In parallel, qualitative semi-structured interviews are in progress, with participants (n=12) purposefully sampled from previously unsuccessful students who passed the November 2025 GCSE maths resit exam.

Pilot interview data indicate that experiences of shame and humiliation associated with previous pedagogical encounters from both peers and teachers, may play a significant role in shaping students’ affective disposition towards learning maths. This is being explored in more detail in ongoing interviews.

Through the involvement of now successful GCSE resit students, the study offers a unique insight and aims to develop both affect-aware interventions and shifts in pedagogy to support this group of learners.

Mathematical resilience – a more effective way of thinking about learning?

Clare Lee – The Open University

Interventions and support strategies:

- Pedagogical innovations and instructional methods

Many researchers have established the prevalence of mathematics anxiety (MA) and the impact that it has on learners. Some reasons for this prevalence must lie with the subject itself, perhaps its symbolic and abstract nature. Some reasons must lie within society itself, who seem to view those who can use and control mathematical concepts as an elite. Many of the reasons for its prevalence, however, must lie with the way mathematics is expected to be taught, often as something to be memorised rather than understood. The ideas that make up the construct of mathematical resilience can provide teachers with a way of thinking about teaching mathematics that develops the learners' capability to manage the affective side of learning mathematics in a more positive manner and thus mitigate MA.

Nardi and Steward in 2003 established in far too many classrooms mathematics was taught in a way that was tedious, isolationist, required rote learning, elitist and depersonalised. Unfortunately, the pressures on today's mathematics teachers mean that their teaching remains TIRED and mathematics anxiety continues to result. Teaching for mathematical resilience (MR) aims to work against this way of teaching. The research on MR indicates that classrooms where the struggle required to learn mathematics is acknowledged, learners feel valued and know that learning mathematics is valuable, the support required for understanding is ever present, be that collegial working or access to resources, and where a growth theory of learning is acted on day in day out, are ones where mathematic anxiety is not exacerbated and where existing MA is overcome and as a consequence learners progress well in mathematics. However, MR can be seen as a to-do list and a to-don't list, whereas I contend it is a way of thinking that foregrounds the well-being of the learners.

Keynote: Dr Ros McLellan, Maths Anxiety Experiences, Triggers and Origins: Implications for Theory and Practice

Research on maths anxiety has been published over the last 70 years, so it could be argued that the construct is well characterised. Much useful quantitative work has been done establishing the relationship between maths anxiety to other important variables such as educational achievement, motivation and wellbeing. However, this keynote will argue that there is still much that is unknown about the experience of maths anxiety and what triggers it in the classroom. It is crucial to look beyond standardized maths anxiety measures to gain a richer understanding to be able to support young people in their maths learning and enable them to flourish.

Contemporary qualitative studies of maths anxiety are surprisingly sparse, despite research over a 70-year period. This presentation will draw from a large-scale mixed methods study following primary pupil (aged 8-9 years) and secondary students (aged 11-12 years) over two school years, which aimed to gain a fuller picture of childhood triggers and experiences of maths anxiety. The qualitative strand entailed interviewing 126 young people twice, three to four weeks apart during which time maths diaries were kept, in the second year of the study to explore their experiences of maths anxiety, making it the largest study of its kind in recent years. The longitudinal design enabled us to distinguish young people with stable maths anxiety from those whose maths anxiety was more transient to provide unique insight into differential maths anxiety experiences. In addition to the manifestation of maths anxiety, key triggers and reflections on the development of maths anxiety will be outlined. The findings raise questions about the stability of maths anxiety and contributes to the conceptualisation of emotion. There are also significant implications for practice that will be discussed.

The interplay of gender ability beliefs, mathematics anxiety, and mathematics performance in early primary education

Romee Halidu, Elske Salemink, Michiel Veldhuis, Madhuvanti Anantharajan, Mara Otten, Brenda Jansen

***Introduction*.** Mathematics anxiety (MA), defined as fear or tension interfering with number processing, can already manifest in primary education (Ashcraft, 2002). Girls typically report higher MA, making them particularly vulnerable to its negative effects on performance. One explanation involves *Gender Ability Beliefs* (GAB), stereotypical ideas that boys are naturally better at mathematics. Such beliefs can undermine girls' confidence, and drive gender gaps in mathematics (Martinot et al., 2025). These stereotypes can become more internalized and impactful with age (Kim et al., 2025).

Research Aim(s). This study investigates how gender and GAB influence mathematical performance through MA in Grades 1 and 3. First, we expect girls to experience more MA than boys, particularly when endorsing traditional GAB. Secondly, among girls who endorse these beliefs, we expect the negative impact of MA on performance to be strongest. Finally, these patterns are compared between grades and over the course of the school year.

Materials and Methods. Data are collected from 359 students (based on an a-priori power analysis) across 17 schools, at the beginning and end of the school year. Through the *Mathematics Scale for Young Children – Revised* (Ganley & McGraw, 2016) and the *Draw-a-Mathematician Task* (Kim et al., 2025) MA and implicit GAB are measured. Explicit GAB is studied exploratory (Steele, 2003). Lastly, mathematical performance is analyzed through school records and a standardized mathematical fluency test (*Tempo Test Automatiseren*; TTA; De Vos, 2010).

Results and Discussion. Initial results revealed a gender gap, with boys outperforming girls in mathematical performance. GAB were found to be present in Grade 3, but not Grade 1. While implicit GAB were not related to MA, explicit GAB were associated with lower MA levels in boys, but not in girls. These results provide a baseline for longitudinal analysis of how early stereotypes and anxiety shape emerging gender gaps.

Keywords: Mathematics anxiety, Gender ability beliefs, Primary education, Mathematics performance

MCLS Topic Selection: Emotion, Comparative Research, Schooling

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Parental and teacher math anxiety: Differential contributions to math anxiety and mathematical competence in primary school children

Caterina Primi, Laura Di Leonardo & Maria Anna Donati

Although average math anxiety in childhood is typically low to moderate, a subset of children already exhibits high MA in primary school (Cargnelutti et al., 2016), underscoring the need to identify early social and environmental risk factors. Previous research has examined parents' MA as a potential contributor to children's MA and mathematical outcomes, but findings remain mixed. Several studies report positive associations between parents' and children's MA, and negative associations with children's math achievement (Oh et al., 2022; Soni & Kumari, 2017), whereas other studies - often relying on samples composed predominantly of mothers - find no direct associations (Akhavein & Finch, 2025; Jameson, 2014). Emerging evidence further suggests that mothers' and fathers' MA may play distinct roles (Maloney et al., 2015; Casad et al., 2015; Szczygieł, 2020); however, interpretation of these findings is constrained by the systematic underrepresentation of fathers. Teachers' MA has also been linked to students' mathematical competence (Beilock et al., 2010; Mizala et al., 2015), yet evidence for direct associations with children's MA is weak or inconsistent (Schaeffer et al., 2020). Importantly, parents' and teachers' MA are rarely examined simultaneously, limiting conclusions about their unique and combined effects. The present study addressed these gaps by examining mothers', fathers', and teachers' MA in relation to MA and mathematical competence in primary school children. Participants were 532 children (52.1% female) attending grades three to five, their mothers and fathers, and their mathematics teachers. Results showed children with highly math-anxious mothers and fathers displayed significantly higher MA and lower mathematical competence compared to children with low-anxiety parents; no comparable differences were found based on teachers' MA levels. Mediation analyses indicated a significant indirect effect of mothers' MA on children's mathematical competence through children's MA. These findings highlight the relevance of family-related emotional factors in early mathematical development.

Keywords: parental math anxiety; teacher math anxiety; intergenerational transmission; mathematical achievement; primary school children

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Who are sensitive? Individual differences in the development of math anxiety and math enjoyment

Sanne Van der Ven & Anne Horvers

The Control Value Theory of achievement emotions (Pekrun, 2006) describes how math-related emotions such as anxiety arise from the child's self-concept, which is related to a child's actual performance, but it is not identical; children with similar math performance can hold different self-beliefs and experience different emotions.
In this study, these differences are investigated using the perspective of Differential Susceptibility Theory (Belsky et al., 2007; Greven et al., 2019). This theory states that individuals vary their sensitivity to environmental influences, also called sensory processing sensitivity (SPS). The theory predicts that the same sensitive individuals thrive more in a positive environment, but suffer more in a negative environment. One such environment is school, where children frequently receive positive or negative feedback. Sensitivity to feedback may make children high in SPS more prone to enter either a virtuous cycle in which high performance and enjoyment enhance each other, or a vicious cycle in which low performance and anxiety reinforce each other (Vu et al., 2022).
In this preregistered study (https://osf.io/bn4wt/overview?view_only=4029c929e9db4dbf8bc4aa18c289e01c) we tested whether SPS moderated (i.e., strengthened) the relationship between (1) math achievement and math self-concept, and (2) math self-concept and enjoyment and anxiety (see also Figure 1).

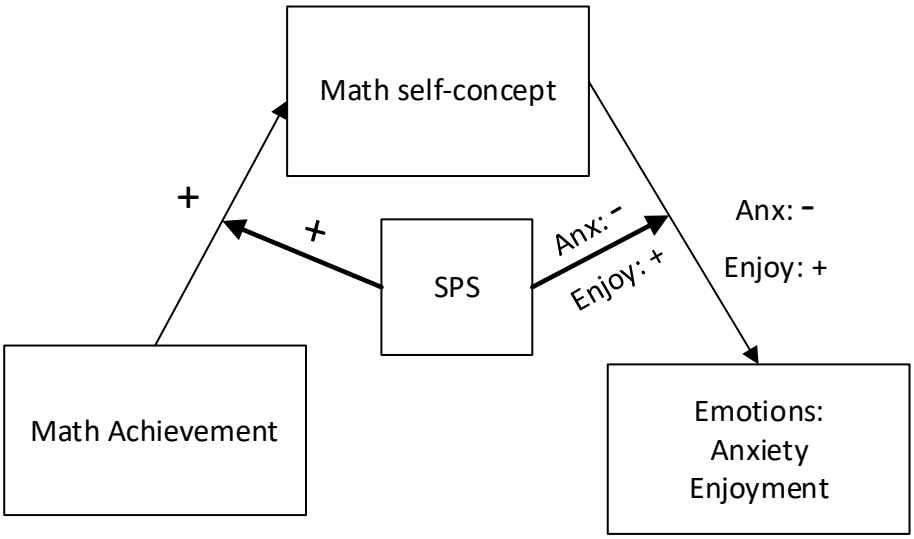

Figure 1. Conceptual model of the study.

133 fifth-grade students from 6 different schools participated. General math achievement scores were obtained from the schools, and math self-concept and emotions were assessed with previously developed questionnaires (Prast et al., 2018). SPS was measured with the Highly Sensitive Child questionnaire (Weyn et al., 2019) and

by measuring the children's electrodermal activity (EDA) after they received feedback on their math performance (Horvers et al., 2021).
All data have been collected and mixed effects models will be carried out using the lme4 package in R (Bates et al., 2015) to test the predicted relations.

Keywords: self-concept, emotions, feedback, sensory processing sensitivity, differential susceptibility

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Keynote: Dr Sweta Adatia, Mathematics Phobia: A Neurological Understanding and Evidence-Based Pathways to Rewiring the Brain

Mathematics phobia, clinically understood as *math anxiety*, is not merely a pedagogical challenge — it is a deeply rooted neurobiological phenomenon with measurable, structural, and functional consequences on the human brain. From a neurologist's standpoint, the condition represents a maladaptive fear-conditioning response, where numerical stimuli trigger the same threat-detection circuits ordinarily reserved for physical danger. Functional MRI studies on children aged 7 to 9 have demonstrated that math anxiety is associated with hyperactivity in the right amygdala — the brain's primary threat-processing centre — alongside markedly reduced activity in the posterior parietal and dorsolateral prefrontal cortex, regions indispensable to mathematical reasoning (Young, Wu & Menon, 2012). This neural signature reveals a fundamental conflict at the heart of math phobia: the emotional brain systematically overpowers the rational brain every time a number appears.

Brain imaging has further revealed that math-anxious individuals activate circuits associated with negative emotional processing, the visceral experience of pain (insula), and inhibitory control — and critically, this emotional control network becomes upregulated even *before* a mathematical task begins, meaning the mere anticipation of encountering numbers is sufficient to ignite the fear response (Supekar et al., 2015). Structural neuroimaging has additionally confirmed that the right amygdala volume is physically reduced in individuals with higher math anxiety, indicating that prolonged exposure to math-related stress may permanently alter brain architecture (Klados et al., 2018) — a finding with profound implications for children navigating years of compulsory mathematics education.

Understanding Mathematics Anxiety through Life Stories: Insights for Adult Learning Environments

Maria Ryan

Adult learners often enter higher education with entrenched negative emotions toward mathematics, shaped by early educational experiences that involve failure, humiliation, or exclusion. Despite global efforts to widen participation and promote lifelong learning (OECD, 2025) mathematics remains a gatekeeper subject (Noyes, 2007) frequently triggering anxiety among adult learners. Mathematics anxiety (MA), as defined by Ashcraft and Moore (2009), significantly impairs confidence, engagement, and academic progression, especially for those returning to formal education after a long break (Safford-Ramus, 2008).

This longitudinal qualitative study explores the mathematics life stories of adult learners enrolled in an initial teacher education programme (ITE) in Ireland. Life story research (McAdams, 1993) was used to uncover the roots and impact of MA. Thematic analysis revealed persistent themes of shame, cognitive blocks, environmental barriers, and social messaging that reinforced fixed mindsets (Boaler, 2016).

Primary school experiences included public embarrassment and fear of punishment, while secondary school narratives emphasised inaccessible pedagogies, rigid pacing, and the internalisation of failure. These findings highlight the misalignment between adult learners' needs and the assumptions of ITE mathematics instruction (Knowles et al., 2005).

The study argues for reflective and empathetic teaching practices that begin by understanding adult learners' mathematical journeys. Educators must create psychologically safe spaces, emphasise relevance, and address emotional and cognitive barriers (Beilock & Willingham, 2014). By doing so, we can begin to dismantle the legacy of MA, improve student retention, and promote equitable participation in mathematically intensive fields.

Keywords: Mathematics Anxiety; Adult Learner; Learning Environment; Higher Education; Initial Teacher Education.

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Mathematics Anxiety Outside of Educational Contexts – The development of a new scale

[1]Ciara Turner, [2]Krzysztof Cipora, [1]Serena Rossi & [1]Kinga Morsanyi
[1] Centre for Mathematical Cognition, Department of Mathematics Education, Loughborough University (UK)
[2] Copernicus Centre of Interdisciplinary Studies, Jagiellonian University, Krakow, Poland

Keywords: Mathematics anxiety, adults, scale development

The primary goal of this project is to develop an understanding of adults' mathematics anxiety (MA) in real-world contexts. Previous studies have mostly focused on individuals still in education, and most MA instruments refer to educational situations (Cipora, 2022; Hart & Ganley, 2019). While measures of everyday MA have been developed previously (e.g. Rolison et al., 2016), they tend to either be part of a bigger instrument, thus not receiving much standalone attention, or they haven't been rigorously validated. Here we aimed at developing an instrument suitable for measuring MA experienced by adults in everyday situations.

Through two preregistered studies, a pilot (https://osf.io/8sfdp) and a later validation study (https://osf.io/qewrc), we sought to develop and validate a questionnaire specifically focused on adults' MA in everyday contexts: Mathematics Anxiety in Everyday Contexts Scale (MAECS). We hypothesised that MAECS correlates with traditional MA instruments and explains subjective and objective numeracy, as well as arithmetic fluency beyond the effect of age, gender, general anxiety, type of profession, and socio-economic status.

Both studies were conducted online via Qualtrics and Prolific on fluent English-speaking adults from the UK. In the pilot study (n = 100) we administered 28 items adapted from previously published mathematics anxiety/appraisal questionnaires referring to everyday situations (Hunt & Maloney, 2022; Rolison et al., 2016; Suinn & Winston, 2003). After analysing the results, we obtained 10 items which made up the scale used in the validation study (n = 300) to investigate the psychometric properties of the scale. Additionally, we administered the AMAS (Hopko et al., 2003), together with measures of general anxiety, subjective and objective numeracy, as well as speeded arithmetic.

MAECS is characterised by a one-factor structure. It has very good reliability: Cronbach's alpha of 0.93, overall omega of 0.95. Interestingly, it only moderately correlated with the AMAS (r=.65). MAECS is a predictor of MA and is an internally reliable scale which has the potential to facilitate easier research into adults' mathematics anxiety outside the education system.

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Not only learners: The importance of acknowledging maths anxiety in teachers

Dr Thomas E. Hunt

Most maths anxiety research has focussed on learners. However, there is increasing evidence that maths anxiety exists in specific non-student populations. Maths-related affective characteristics of primary school teachers are important for students' mathematical emotions, attitudes, and achievements. This presentation reports on the findings from a recently published study on 1153 primary school teachers in the U.K., Poland, Slovakia, Serbia, Türkiye, and Iran, in which mean levels and correlates of maths anxiety, maths teaching anxiety, and maths attitudes were explored. We observed that, in general, teachers were characterized by low-to-moderate math anxiety and math teaching anxiety, and neutral-to-positive math attitudes. We also observed relationships between all the variables in accordance with expectations. Our study allows for a more systematic view on the domain-specific characteristics of primary school teachers across several countries. This represents an important step in understanding commonalities in math-specific emotions and attitudes among primary school teachers. Within the presentation, the importance of identifying and supporting future and existing teachers will be discussed, alongside issues concerning measurement. Findings will be discussed in the context of other recently published work, providing the context needed to consider next steps.

Mathematics anxiety, mathematics teaching anxiety and general anxiety in teachers, and their links with primary school pupils' mathematics anxiety and mathematics performance

Kinga Morsanyi, Loughborough University, UK; k.e.morsanyi@lboro.ac.uk
Andy Ash, University of Cumbria, UK; aash@ourladyofpity.co.uk
Carlo Tomasetto, University of Bologna, Italy, carlo.tomasetto@unibo.it

Maths anxious teachers may behave in the classroom in ways that hinder pupils' mathematics learning. For example, they may spend less time on answering student questions (Bush, 1989), respond angrily when pupils ask for help (e.g., Cornell, 1999), place too much emphasis on rote learning (e.g., Vinson, 2001) and follow traditional and rigid teaching practices (e.g., Markovits, 2011). Nevertheless, research in this area remains scarce (Ganley et al., 2019), and there is even less research linking teachers' anxiety to pupils' outcomes. To address these issues, in Study 1, 256 teachers from the UK and 209 teachers from Italy reported their mathematics anxiety, teaching anxiety and general anxiety, together with their teaching experience, job roles and the demographic characteristics of their pupils. In Study 2, 33 primary school teachers and 321 pupils from these teachers' classes participated. In addition to the variables measured in Study 1, pupils' mathematics anxiety, general anxiety and their mathematics performance were also assessed. The results indicated a strong link between teachers' mathematics anxiety and their teaching anxiety, although the two constructs showed some divergent validity, suggesting that maths teaching anxiety is largely determined by the same factors as mathematics anxiety (or may originate in mathematics anxiety). In Study 2, multiple regression analyses showed that pupils' mathematics performance was significantly predicted by their mathematics anxiety and socio-economic status, but teachers' mathematics anxiety, mathematics teaching anxiety or general anxiety were not significant predictors. Pupils' mathematics anxiety was predicted by their gender, mathematics anxiety and numeracy levels, as well as teachers' general anxiety levels, but not by teachers' mathematics anxiety or mathematics teaching anxiety. These results suggest that it is unlikely that pupils would internalise teachers' mathematics-related feelings. Nevertheless, general anxiety in teachers (which may reflect higher stress levels) may contribute to an anxiety-provoking classroom climate.

Keywords: keywords: mathematics anxiety, mathematics teaching anxiety, mathematics achievement, general anxiety.

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Keynote: Veronica Cavicchi, From Evaluation Threat to Supported Agency: Reducing Mathematics Anxiety Through Supportive STEM Environments

Mathematics anxiety in adolescence is not only a personal reaction to difficulty. It is also shaped by evaluative threat, avoidance, low perceived competence, and the relational climate of the classroom. This talk proposes an evidence-informed framework for reducing mathematics anxiety through supportive STEM environments. Drawing on research on mathematics anxiety, recent work on youth anxiety that highlights action over reassurance, and classroom-based educational practice, I argue that hands-on and well-scaffolded STEM activities can reduce threat without removing challenge. Peer tutoring, low-stakes participation, reflective writing, metacognitive routines, and clear teacher support can help students remain engaged with mathematics instead of withdrawing from it. Qualitative observations from upper-secondary school settings in Italy suggest that students often associate anxiety with oral assessment, timed tasks, public exposure, and mathematics-related evaluation. Protective factors reported by students include peer support, clarity of expectations, breathing routines, structured rehearsal, and opportunities to revise errors. Rather than presenting STEM as a cure, the talk shows how meaningful, cooperative, and well-designed learning environments can buffer mathematics anxiety by strengthening self-efficacy, belonging, and reflective engagement.

Mathematics Anxiety Shapes STEM Learning in American Sign Language

Rachel Sortino

Keywords: Math Anxiety, Sign Language, Deaf/Hard-of-Hearing, STEM Learning, Electrodermal Activity

Anxiety about mathematics, science, and spatial skills is associated with reduced motivation and lower success in STEM fields.[1] While the long-term effects of trait-level math anxiety are well documented, we have fewer data on how long-term mathematics anxiety impacts learning as compared to "in-the-moment" state-level anxiety during the learning process.[2] Moreover, recent studies suggest that elevated levels of mathematics anxiety are a potential contributing factor to the low levels of representation of deaf and hard-of-hearing (DHH) individuals in STEM.[3] Some of this heightened anxiety could be attributed to the lack of accessible materials in sign language for learning STEM content. We created STEM lessons in American Sign Language (ASL) to measure how mathematics anxiety influences learning in signing adults. Participants (N = 60) completed a pre-test, watched four 5-minute-long video lessons, then completed a cognitive task and post-test. Using mixed-effect linear models that controlled for random variation due to topic and individual differences, we found that self-reported trait-level mathematics anxiety was related to both pre- and post-test performance. Specifically, higher anxiety predicted lower test scores. However, participants' self-reported state-level anxiety after watching each lesson was only predictive of pre-test scores, implying anxiety during the lessons was related to a lack of prior knowledge and did not necessarily impede future learning. In addition to self-reported anxiety, we collected electrodermal activity (EDA) for a subgroup of participants (n = 26) during the lessons. This psychophysiological measure of state-level anxiety did not predict pre- or post-test performance when added to the model, possibly because physiological arousal can occur both for anxiety and engagement. Overall, these results suggest that while trait-level academic anxieties have the negative impact on performance seen in previous research, state-level anxiety during learning is only predictive of prior knowledge, not how much people will learn.

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Understanding and Supporting Students Experiencing Maths Anxiety in a UK Distance-Learning University

Susan Pawley

The Open University (OU) is the UK's largest university. Operating an open access distance-learning model, we educate approximately 124,000 students of which over 40,000 are studying within the STEM (Science, Technology, Engineering and Mathematics) faculty.

During 2021/22 we conducted a large mixed-methods study across introductory modules that contained an element of mathematical content. We used the recognised Maths Anxiety Scale [Betz 1978] augmented with additional questions to investigate factors specific to distance learning to establish the extend of maths anxiety of students entering our university.

Findings suggest that 43% of students who responded are visibly anxious, with 26% of these students believing that studying at a distance will increase their anxiety and a further 27% undecided on whether it will have an effect.

To explore these issues in-depth, we conducted semi-structured interviews with students that displayed the highest anxiety, examining how their anxiety manifests and their concerns for how it will affect future study.

To support the large number of students experiencing maths anxiety within the OU we have developed an openly available online course designed to guide our students through how and why maths anxiety can arise and provide practical strategies that will help them manage it and succeed. The course is promoted across the faculty and in online sessions which aim to raise awareness of and normalise maths anxiety.

The presentation will report on the extent of maths anxiety within the OU, briefly highlighting differences across subject disciplines, genders, and ethnic groups, drawing on both the quantitative and qualitative data, and will introduce our course developed in response, presenting preliminary findings on uptake and impact.

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Keywords: Higher education support, Quantitative study, Qualitative study, Distance Learning, Student Experience

Posters

Masha Apostolidu: Predicting mathematics self-efficacy and anxiety in further education students: the importance of individual psychological varia

Laura Barrera Romero: The pace model of mathematical anxiety: a multidimensional framework based on a systematic review

Rachid Berd-Gómez: Anxiety about teaching math in Spain. Psychometric Study of MAST15 and MTAS19 instruments

Tanya Evans: Affective Profiles of Undergraduate Mathematics Students: Exam-Related Anxiety, Achievement Emotions, Self-Efficacy, and Stress

Paula Fieldhouse: Can an intervention for parents reduce the intergenerational transmission of Maths Anxiety – A doctoral study

Emma B Fleming: Beyond the Score: Defining Mathematics Confidence and the Impact of Grading

Joseph Gottah: The DigiBus: A Confidence-Led, Student-Owned Diagnostic Tool for Reducing Mathematics Anxiety in Post-16 Education

Romee Halidu: IMA Exploring Teacher Mathematics Anxiety A Multi Method Study into Implicit Associations, Self-Reports, and Classroom Manifesta

Stacy Marshall: An Exploration into the Relationship Between Number Talks, Anxiety, and Attitudes Towards Mathematics for Primary Girls in England

Jack Morewood: Investigating feelings about mathematics among architecture, building and planning students in the United Kingdom

Kei Shing Ng: Comparative Analysis of Mathematics Anxiety Among Form 5 Students in Hong Kong's Tiered Schooling System

Elham Rezasoltani: Reducing Mathematics Anxiety through Peer-Led Team Learning in Undergraduate Physics

Beatriz Ruiz: Understanding Maths Anxiety in Mexico: Emotional Skills and Early Primary Students' Performance

Flavia Santos: Profiling emotional and educational factors linked to Statistics achievement

Eva Van de Weijer-Bergsma: Do coping strategies moderate the relationship between math self-concept, math anxiety and math performance?

Sara Vergallo: Reducing Math Anxiety Through Mindful Breathing in First-Year STEM Students

Silke Wortha: Math Anxiety in Later Life: Distinct Impacts on Cognitive Interference, Health Literacy, and Financial Well-being

Anastasiia Yakovenko: From Mathematics Anxiety to Mathematics as Therapy: Real Cases from a Ukrainian University