



FACTOR COMPOSITION OF
MATHEMATICS ANXIETY IN
UNDERGRADUATE MATHEMATICS AND
PHYSICS STUDENTS

Jamie Smith and Nikolaos Fotou
University of Lincoln

Introduction



Jamie Smith

Mathematics and Statistics Advisor/
Associate Lecturer

MASH, Uni. Of Lincoln
School of Education, Uni. Of Lincoln

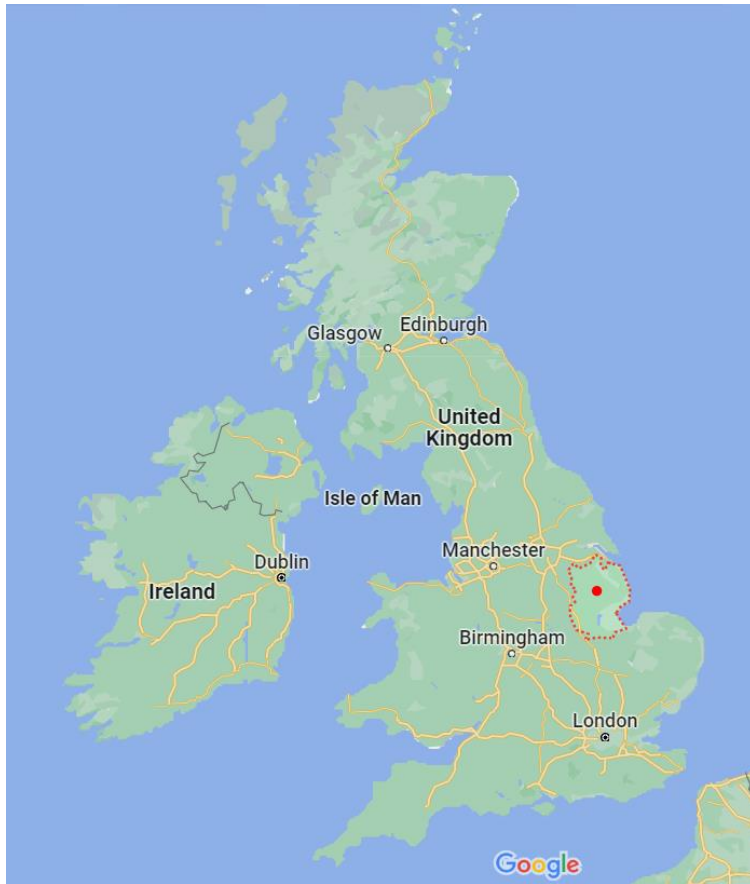


Dr Nikolaos Fotou

Senior Lecturer /
Programme Leader

School of Education, Uni. Of Lincoln

Lincoln, UK



The University of Lincoln

c.20,000 Students

College of Science

College of Social Science

College of Arts

International Business School

Mathematics Anxiety

A negative emotional reaction to mathematics that includes feelings of tension and nervousness that interfere with the manipulation of numbers and the solving of mathematical problems (Richardson & Suinn, 1972).

An estimated 85% of all students experience mathematics anxiety (Perry, 2004)

Students with high levels of this situational-specific anxiety often practice mathematics avoidance (Hembree, 1990). This can be at a task-level or a subject-level.

Symptoms of Mathematics Anxiety

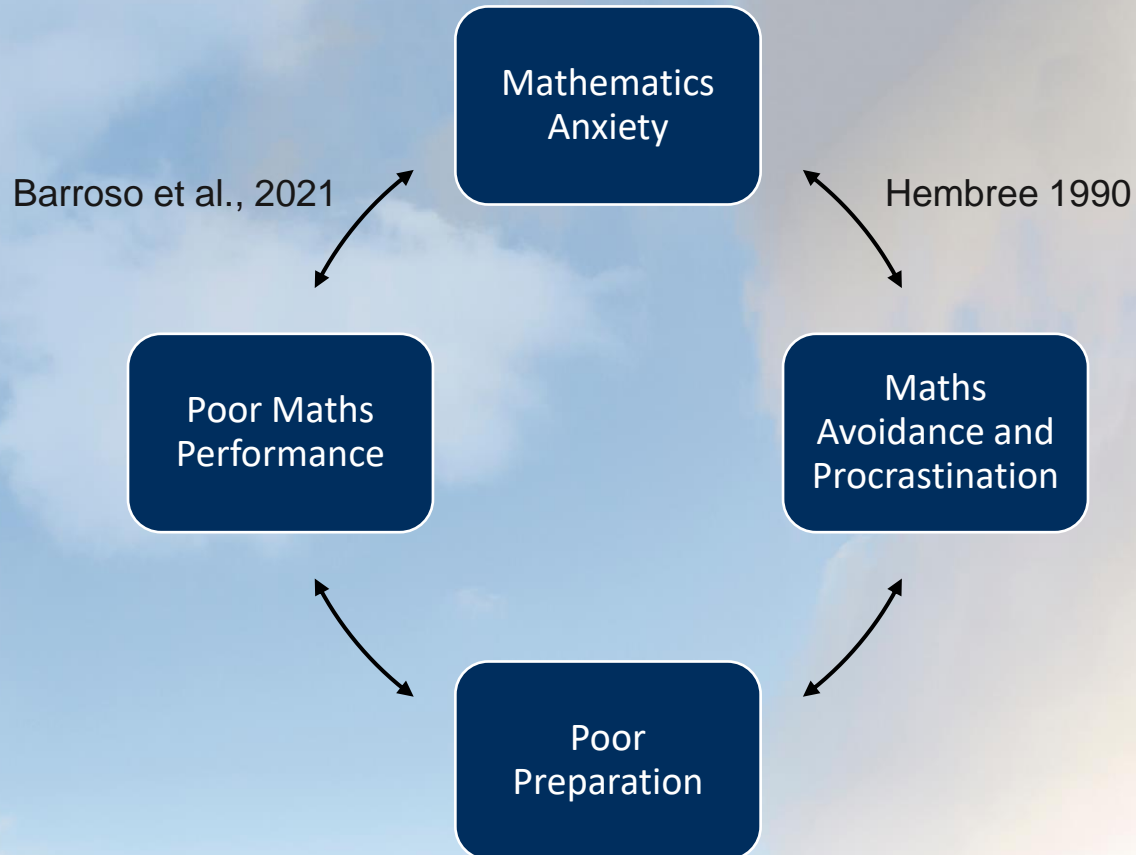
Emotional symptoms:

feeling of helplessness
lack of confidence
fear of getting things wrong
feeling frustrated

Physical symptoms:

heart racing
irregular breathing
sweatiness
shakiness
biting nails
feeling of hollowness in stomach
nausea

The Mathematics Anxiety Cycle



Present Study

Previous works have explored the structure of mathematics anxiety in various bodies of students.

This work considers the composite structure of mathematics anxiety in a specialist sample of Mathematics and Physics Undergraduates.

Mathematics anxiety was measured using the **Mathematics Anxiety Scale–UK** (MAS-UK; Hunt et al., 2011)

Characteristics	Students	
	n	%
Gender		
Male	84	33.33 %
Female	42	66.67 %
Level		
Year 1	36	28.57%
Year 2	43	34.13%
Year 3	43	33.33%
Year 4	5	3.97
Course		
Mathematics	79	63.20%
Physics	32	25.60%
Dual Honours	14	11.20%

Factor Analysis

CFA using the original three factors showed that our data did not support their three-factor model.

PCA on the items with our sample indicated a four-factor construction

Social
Learning
Evaluation
* Routine *

Items	Factor Loadings			
	1	2	3	4
Factor 1: Social Mathematics Anxiety				
Q22: Working out how much change a cashier should have given you in a shop after buying several items.	0.831			
Q14: Deciding how much each person should give you after you buy an object that you are all sharing the cost of.	0.662			
Q4: Being asked to add up the number of people in a room.	0.628			
Q2: Adding up a pile of change.	0.624			
Q1: Having someone watch you multiply 12×23 on paper.	0.624			
Q7: Being asked to calculate £9.36 divided by 4 in front of several people.	0.604		0.531	
Q8: Being given a telephone number and having to remember it.	0.563			
Q21: Being asked to calculate three fifths as a percentage.	0.509			0.467
Factor 2: Learning Mathematics Anxiety				
Q12: Listening to someone talk about mathematics.		0.863		
Q16: Watching someone work out an algebra problem.		0.847		
Q15: Reading a mathematics textbook.		0.770		
Q17: Sitting in a mathematics class.		0.764		
Q20: Watching a teacher/lecturer write equations on the board.		0.554		0.472
Factor 3: Evaluation Mathematics Anxiety				
Q23: Being asked a mathematics question by a teacher in front of a class.			0.829	
Q3: Being asked to write an answer on the board at the front of a mathematics class.			0.815	
Q18: Being given a surprise maths test in a class.			0.657	
Q6: Taking a mathematics exam.			0.629	
Factor 4: Routine Mathematics Anxiety				
Q19: Being asked to memorize a multiplication table.				0.709
Q5: Calculating how many days until a person's birthday.				0.668
Q10: Calculating a series of multiplication problems on paper.				0.659
Q11: Working out how much time you have left before you set off to work or place of study.				0.459
Loadings of less than 0.45 were suppressed [12]				

Gender Differences

	Males		Females		U	z	p
	M	SD	M	SD			
UK-MAS	42.73	11.89	51.29	13.11	3.52	114	<.001
EMA	12.70	4.25	15.85	3.21	933	3.80	<.001
LMA	6.88	2.72	8.00	3.78	1344.5	2.26	.024
SMA	14.22	4.75	16.78	6.05	1225	2.45	.014
RMA	6.66	2.84	7.71	2.88	1304.5	2.14	.033

Gender differences were calculated using Mann-Whitney U-tests as the sample was not normally distributed.

Course Differences

	Mathematics		Physics		Dual Honours		H(2)	p
	M	SD	M	SD	M	SD		
UK-MAS	46.48	12.19	47.41	14.77	37.36	8.86	7.24	.027
EMA	14.27	4.06	13.22	4.37	11.00	4.08	7.72	.021
LMA	7.49	3.39	7.34	2.89	5.86	1.75	5.24	.073
SMA	14.96	4.98	16.44	6.91	11.86	3.35	6.34	.042
RMA	7.01	2.88	7.47	3.14	6.07	1.90	1.90	.386

Course-level differences were calculated using Kruskal-Wallis tests as the sample was not normally distributed.

Differences were between single and dual-honours students.
 No differences were detected between Mathematics and Physics Students

Conclusions

Our specialist students, those who have committed to spending multiple years of their lives and tens of thousands of pounds to study mathematics, still experience mathematics anxiety.

All STEM teachers / instructors / lecturers should be aware to the apprehension and worry their students face in mathematics.

Future interventions to directly address the causes and effects of Mathematics Anxiety should include all students including those we might otherwise expect to have low levels of mathematics anxiety.

References

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