'Maths Anxiety' in Secondary School Students

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Introduction

A basic level of mathematical ability has long been recognised as essential to everyday life with mathematics necessary for most occupations (CBI, 2006). It is reasonable to assume that the readership of 'Radical Statistics' have a good understanding of maths, however there are many people who struggle with maths which in turn could potentially "close off important means of access to society's resources" (Schoenfeld, 2002, p.13). There is concern that mathematical ability is unacceptably low (Chinn, 2009). To improve an understanding of the problem and of teaching skills, recent textbooks include Smith's (2002), 'The Glass Wall: Why Mathematics Can Seem so Difficult' and Ollerton's (2006) wonderfully titled, 'Getting the Buggers to Add Up'! In addition Ofsted (2008) have observed a lack of confidence when faced with new mathematical challenges.

So why might people find mathematics difficult? Research can be grouped into three aspects which could affect an individual's capacity to learn mathematics: 'Dyscalculia', which affects a child's concept of numerosity (Butterworth, 2005); the education system and learning environment; and social and cultural factors, including the 'fear factor', when confronted by mathematics. Known as 'maths anxiety', this fear factor is the focus of this paper.

Maths anxiety is the fear, or feeling of tension and uneasiness that affects maths performance (Newstead, 1998). It is only weakly related to overall intelligence but individuals suffering from high anxiety often produce poor maths grades and therefore appear to lack ability (Faust, Ashcraft & Fleck, 1996; Ashcraft, 2002). Those with a more positive attitude towards maths have lower anxiety levels and those with higher anxiety produce lower levels of achievement and are more likely to avoid maths (Hembree, 1990). Although the majority of research shows high anxiety to have a negative effect, Wigfield & Meece (1988) demonstrate that for some, the desire to succeed can have positive consequences. Ultimately their evidence supports the negative impact of maths anxiety, but the possibility of positive effects should not be ignored.

The literature points towards several broad themes which relate to maths anxiety: pupil identity, gender, student perceptions of maths and mathematicians, ability grouping in schools and teacher / pupil

interactions. Research also identifies several types of anxiety. The overall impression gained from the literature is that whatever somebody's *actual* ability, their *perception* of their own ability and their *confidence* when using numbers and mathematical concepts, may differ somewhat. In this paper I next discuss these themes before then describing how data have been gathered from secondary school pupils in North Yorkshire and analysed to determine which aspects appear to relate to maths anxiety.

Key Themes relating to maths anxiety

Pupil identity is an important factor within the classroom since how pupils identify themselves can affect how much they engage and interact with activities. If they identify themselves as 'non-participators', they are unlikely to engage fully with maths problems as they, and others, will perceive them as a 'non-participator.' Students construct and negotiate their identity as they interact with their peers and teachers, and engage with classroom activities. Students are often influenced and shaped by teachers and the practices they adopt (Solomon, 1998), which in turn affects how others see the students and how they see themselves (Black, 2004). Student self-identify is crucial for their entire learning career so it is important for them to construct positive identities, which enable them to be successful within the classroom. Pupil identity is often linked with other factors, which will be noted below within other themes.

Gender is frequently researched and in relation to maths it has been suggested that females are less able than males, highlighted through an unsubstantiated belief that there *must* be a biological basis as to why men achieve more in maths (Hyde *et al.,* 1990). Teachers can attribute a male's success to ability whereas a female's success would be due to effort (Fennema *et al.,* 1990). In relation to maths anxiety, females report far higher levels of anxiety than males (Hembree, 1990). Male and female students report similar levels of maths worry, indicating an equal concern with succeeding (Wigfield & Meece, 1988).

In terms of ability, females appear more likely to score *at least* as well as males in maths. However it seems females tend to have higher anxiety levels and to have a mastery approach to maths (wanting to learn to understand, rather than to show high performance) (Kenny-Benson *et al.,* 2006). Males, however, are more likely to believe themselves to be good at maths (Bartholomew, 2000). Gender can impact on the quantity and quality of interactions experienced by students in whole class discussions, with males generally at an advantage (Black, 2004), thereby encouraging positive mathematical identities in males, but not females. Overall it appears that although

all students are vulnerable to experiencing maths anxiety there is a difference between the experience of males and females.

Ability grouping is an established dynamic that has been used in schools for as long as most of us can remember. In more recent years alternative structures have been adopted including the use o*f mixed-ability* grouping. However, within maths departments this concept is often not received well. Despite efforts to reform mathematics in the classroom many teachers and mathematical traditionalists believe that the current curriculum and competitive nature of western education is not suited or compatible with mixed-ability grouping (Boaler, 1997b, Boaler, 2002). Evidence by Boaler (2008) has demonstrated however that by mixing ability in class, students could interact with others of varying social class, culture and ability therefore encouraging students to approach maths in more diverse ways. By mixing abilities, students learned to value and respect other students' ideas and approaches to solving maths.

Evidence suggests a strong impact, from sets, on how successful students will be in their maths class and that ability grouping has a complex and highly influential role in pupils' identities (Solomon, 2007). Students have reported being unhappy about the sets in which they are placed and feel they should be in either different or mixed groups. This is often due to the pace of the class not suiting the student and to the teacher over- or under-estimating students' capabilities (Boaler, 2000). It seems that if students believe they are in the right group they are more likely to succeed.

Teacher-pupil interactions can affect a student's achievement, perception and the overall classroom climate (Amidon & Simon, 1965). Similarly the expectations of the teacher tend to have numerous long-term effects, linked to the student's construction of identity (Black, 2004). Interactions experienced by students strongly influence their experiences and identity, and prior experience and pupil identity affects how much and how well students engage with maths. Boaler (2000) highlights the high value students place on their relationships with classmates when learning maths. Therefore the interactions occurring between everyone in the classroom is of high importance for learners.

The *perceptions and beliefs* of teachers, parents and students of maths and of the students' mathematical capabilities are highly influential on the student's learning experience. A direct link has been found between parental expectations and their children's participation with maths (Ma, 2001). Students' beliefs about what is useful in maths has a powerful influence on their achievements and their beliefs often affect the cognitive resources available to them when learning. Prior experience frequently determines which information students think is

relevant and evidence suggests that students believe they can master the subject if they worked hard. However, it seems that many expect homework and problems to be solved in less than twelve minutes, any longer and they believe it to be impossible. The conclusion is that students hold quite rigid views about maths and mathematicians and these strongly affect how successful or anxious they may be (Schoenfeld, 1989; Mason and Scrivani, 2004).

So, are there different types of anxiety? It has been recognised that 'maths anxiety' as a concept, is perhaps too broad, since there may be different types of anxiety depending on the situation. Research has found that although maths anxiety and exam/test anxiety are related, they are not necessarily identical (Dew *et al.,* 1984). Different teaching methods could also create anxiety in students when discussing or solving maths problems. More specifically, high levels of anxiety in students have been found when dealing with social and public aspects of maths (Newstead, 1998).

To summarise, maths anxiety, as a lack of confidence in one's mathematical ability, is shown by the literature to relate with various factors. These have been themed here as: pupil identity, gender, ability grouping, teacher/pupil interactions and perceptions about maths and mathematicians. Different types of anxiety are also likely to exist. The aim of this research is to investigate these themes to better understand their role in students' maths anxiety, and to perhaps discover which has the most effect.

This research will not directly focus on teacher/pupil interactions or different types of anxiety because to fully study the interactions taking place in the classroom would involve observations which are simply not feasible at this time. However it will be addressed indirectly through questions focusing on student's confidence when answering questions in public or privately.

Data collection and methods

Design

Data were collected through a questionnaire of students across school years 7, 8 and 9 (including ages 11 to 14) in two secondary schools in North Yorkshire. To complement this, a sub-sample of respondents was interviewed to add depth.

School Context

Two secondary mixed-sex state schools participated in this research. Both are relatively small and are located in the vicinity of two state 'grammar' schools resulting in 32% of the best students in the area being selected to attend these 'grammar' schools. This therefore affects the two participating schools and the student intake.

Procedure

Questionnaire. A questionnaire was designed consisting of a series of questions or statements aimed at obtaining information relating to the themes identified in the literature. The questions covered student's basic demographics, their ability grouping, confidence levels and their perceptions of maths and mathematicians. The questions were mostly in a Likert-type scale format, with a few needing a written response. Table 1 lists example questions and statements which were in the questionnaire.

Table 1: Content of questionnaire distributed to students in academic years 7, 8 & 9

Theme	Question / Statement
Anxiety	Are you confident when trying to complete a maths question in school?
	Are you confident if you have to answer a maths question in front of the whole class?
Demographics	Male or female?
	What is your father's occupation?
	What is your mother's occupation?
Ability grouping	Which maths group are you in?
	Where in your maths group would you say you are in terms of ability?
	Do you feel the maths group you are in is the right one for you?
Perceptions & beliefs	Do you think you will continue to study maths after your GCSEs?
	How often do you think you will use the maths you have learnt at school in day-to-day life or in a job?
	Maths is interesting
	Maths is useful
	Maths is one of my best subjects
	People who are good at maths are generally clever
	I am naturally interested in mathematics
	Maths is important to get a good job
School	Identifier for school 1 & 2

Participants. The questionnaires were distributed to all pupils in the school years 7, 8 and 9. Some students from within this cohort were then randomly invited for follow-up interviews.

Interview. Each interview was semi-structured and was based on answers given in the questionnaire. The interview aimed to go beyond the questionnaire and determine why the students felt as they did about maths and to obtain more information regarding their confidence. Each interview lasted approximately ten minutes.

The questionnaires were transcribed and the data organised using Excel and then imported into SPSS to be analysed. Some of detailed Likert scale questions were collapsed into simpler categories. The main outcome of interest, whether or not somebody experienced maths anxiety, was based on responses to the question:

> ***"Are you confident when trying to complete a maths question in school?"***

An additional question sought to find out about a different type of anxiety:

> ***"Are you confident if you have to answer a maths question in front of the whole class?"***

Both of these questions allowed cross-tabulations with the other categorical variables. Since the outcomes are dichotomous, a binary logistic regression model, which as a technique has widespread use in educational psychology (Brace *et al.,* 2003), is appropriate to determine the likelihood of anxiety as influenced by a variety of factors.

The results and what they show

From the three academic years, a total of 216 questionnaires were returned by the students from school 1 and 120 from school 2 (Table 2). This represents response rates of 58% and 68% respectively. In terms of maths anxiety, the outcome of interest, 43% reported that they lacked confidence when completing maths questions. A higher percentage of students, 58%, were unconfident when answering a maths question in front of their class.

The modelling strategy adopted was to work through the themes identified in the literature and determine which variables within these themes were related to the general anxiety outcome. When the relationships have been established, then the outcome is changed to the reporting of a lack of confidence in maths in front of their class.

Table 2: Number of students completing the questionnaire and participating in the interviews

	Questionnaire				Interview	
	School 1	%	School 2	%	School 1	School 2
Males	115	53.24	73	60.83	1	2
Females	101	46.76	47	39.17	3	1
Year 7	47	21.76	30	25.00	2	1
Year 8	59	27.31	47	39.17	1	1
Year 9	110	50.93	43	35.83	1	1
Total	**216**		**120**		**4**	**3**
Response rate	58%		68%			

Table 3: Response frequencies and percentages of relevant variables

	Higher SC	%	Lower SC	%
Social Class	204	62.2	124	37.8

	Confident	%	Anxious	%
Anxious about maths in private?	189	57.6	139	42.4
Anxious about maths in public?	137	41.8	191	58.2

	Yes	%	Maybe	%	No	%
Do you feel you're in the right group?	212	64.6	89	27.1	27	8.2

	Disagree	%	No opinion	%	Agree	%
Is maths difficult?	93	28.4	131	39.9	104	31.7
Is maths interesting?	113	34.5	98	29.9	117	35.7
Is maths your best subject?	137	41.8	81	24.7	110	33.5

Interpretation of responses according to - <u>demographics</u>

To investigate the *demographic* information, the first binary logistic regression model included student's gender and social class. The social class variable was derived from questions where students reported their parents' occupations. Occupations were linked to social class (ONS, 2008) and the higher of the two was used in the model. The odds ratio for females compared with males of 1.72 (CI 1.96-2.69) suggests that females are more likely to lack confidence in carrying out maths problems. Compared with the reference level of high social class, students whose parents were of low social class were significantly less likely to experience maths anxiety (odds ratio = 0.52, CI 0.33 to 0.83). Perhaps the greater likelihood of students from higher social class backgrounds being more anxious could be linked with family expectation and pressure to perform.

The next model investigated the *ability grouping* theme. This model included variables about the maths group students were in (top, middle or bottom set) and whether they felt they were in the right maths group. The variables found to include significant relationships with anxiety were the maths group students were in and whether they thought they were in the right group. Compared with students in the top maths group, those in the middle and bottom group were progressively more likely to be unconfident about maths (odds ratios 1.93 middle group; and 2.01 bottom group) but the difference is only significant for the middle group (CIs 1.52-3.25 middle group; and 0.98-4.11 bottom group). Particularly telling though is that when students thought they *might* not be in the right group (odds ratio 2.7; CI 1.57-4.51) or *were not* in the right group (odds ratio 10.61, CI 3.48-32.3) they were more likely to be unconfident in solving maths problems compared with those students who thought they were in the right group. Overall, only 31% of students who thought they were in the right group reported a lack of confidence. Of those who were not reporting being in the right group, over 63% were not confident in solving maths problems.

Various questions were asked of respondents on their *perceptions & beliefs* of maths and mathematicians. In response to whether they thought maths was difficult, these students were more likely than those who do not think maths is difficult, to experience maths anxiety (Odds Ratio = 3.21, CI 1.66-6.06). The majority of students (76%) claimed that maths was not one of their best subjects, as might be expected. Compared with these students, those who agree that maths is their best subject (Odds Ratio = 0.43, CI 0.24-0.80) were less likely to report lack of confidence. Those who stated that they found maths to be interesting were less likely to experience anxiety than those who do not find maths interesting (Odds Ratio = 0.30, CI 0.16-0.56). Any statements on the questionnaire which students were asked to comment regarding their views on mathematicians or on their future use of maths had no significant relationships with maths anxiety.

The variables investigated under the three themes were then combined into one model to determine their relative influence on the reporting of lack of confidence. As a further control, a dummy variable was included to check whether the results were consistent in the two schools.

Interpretation of responses according to - lack of confidence in completing maths problems.

Table 4 shows the output of the full model investigating whether or not students report lack of confidence in completing maths problems as influenced by a range of demographic, ability grouping and perception / belief factors. The general pattern for each variable remains, but, for the demographic factors once the other variables are included, the difference between males and females is no longer significant. Those from low social class backgrounds remain less likely to report lack of confidence. In terms of ability grouping, the gradients previously identified remain but now it is the bottom maths group which is significantly more likely to report anxiety. There is though a much larger difference in response to the question on whether students feel they are in the right maths group. Those who are unsure, but particularly those who think they are in the wrong group are more likely to report lack of confidence than those who think they are the right group. In terms of their perceptions and beliefs, those who find maths difficult are more likely to lack confidence whereas, as might be expected, those who agree that maths is their best subject and those who find maths interesting are less likely to report lack of confidence (though not all categories are significant). There is no significant difference in reporting confidence between the two schools.

Overall then, controlling for all other factors, the largest and most interesting effect is that when students believe they are in the wrong maths group, they are more likely to report lack of confidence and therefore have higher levels of anxiety. It is useful to express the results of a logistic regression model as probabilities of the outcome occurring (Dale *et al.,* 2000).

For example, for students in the reference categories for all the variables in Table 4, the estimated probability of being anxious is 0.33. This increases to 0.50 for students who are not sure whether they are in the right group and to 0.79 for students who think they are in the wrong group.

Table 4: Modelled odds of reporting lack of confidence in solving maths questions

Theme	Question / Statement	Category					
Anxiety	Are you confident when trying to complete a maths question in school?	Yes / No	Outcome variable				
			B	Odds Ratio	CI Lower	CI Upper	p-value
Demographic	What is your sex?	Male (ref.)					
		Female	0.3440	1.41	(0.84	2.37)	0.20
	Highest Social Class in household	High Social Class (ref.)					
		Low Social Class	-0.9250	0.40	(0.23	0.69)	0.00
Ability grouping	Do you feel the maths group you are in is the right one for you?	Yes (ref.)					0.00
		Maybe	0.7260	2.07	(1.15	3.71)	0.02
		No	2.0560	7.82	(2.31	26.52)	0.00
	Which maths group are you in?	Top (ref.)					0.04
		Middle	0.5670	1.76	(0.99	3.13)	0.05
		Bottom	0.8970	2.45	(1.11	5.41)	0.03
Perceptions & beliefs	Mathematics is difficult	Disagree (ref.)					0.01
		No opinion	0.4770	1.61	(0.83	3.14)	0.16
		Agree	1.1300	3.10	(1.54	6.24)	0.00
	Maths is one of my best subjects	Disagree (ref.)					0.13
		No opinion	-0.0630	0.94	(0.49	1.82)	0.85
		Agree	-0.6460	0.52	(0.27	1.02)	0.06
	Maths is Interesting	Disagree (ref.)					0.00
		No opinion	0.0000	1.00	(0.53	1.89)	0.99
		Agree	-1.1430	0.32	(0.16	0.63)	0.00
School	Which school?	School 1 (ref.)					
		School 2	-0.3270	0.72	0.41	1.28	0.26
		Constant	-0.7100				

Interpretation of responses according to - lack of confidence when answering in front of a class

To determine whether the same patterns are found, the outcome variable was changed in the above full model to investigate responses to the question relating to answering a maths question in front of their class. Essentially, Table 5 demonstrates that the broad patterns previously observed remain. Although there is less of a difference from the reference category, the most influential variable is still whether students feel that the maths group they are in is the right one. This outcome represents a situation in which a greater percentage of students report anxiety, which is consistent with the 'exposure' that carrying out maths in front of others will bring. This is reflected in the probabilities calculated using the model outputs.

For those students in the reference categories, who believe they are in the right maths group, there is an estimated probability of 0.53 of them reporting being anxious. This probability then increases to an estimation of 0.62 for students who are not sure whether they are in

the right group. The highest probability, 0.84, is found for those who think they are in the wrong group.

Table 5: Modelled odds of reporting lack of confidence in solving maths questions in front of the class

Theme	Question / Statement	Category					
Anxiety	Are you confident when trying to complete a maths question in front of the whole class?	Yes / No			Outcome variable		
			B	Odds Ratio	CI Lower	CI Upper	p-value
Demographic	What is your sex?	Male (ref.)					
		Female	0.4970	1.64	(1.00	2.71)	0.05
	Highest Social Class in household	High Social Class (ref.)					
		Low Social Class	-0.4390	0.64	(0.39	1.08)	0.09
Ability grouping	Do you feel the maths group you are in is the right one for you?	Yes (ref.)					0.04
		Maybe	0.3750	1.45	(0.80	2.63)	0.22
		No	1.5440	4.68	(1.28	17.14)	0.02
	Which maths group are you in?	Top (ref.)					0.07
		Middle	0.5170	1.68	(0.98	2.89)	0.06
		Bottom	0.7800	2.18	(0.99	4.79)	0.05
Perceptions & beliefs	Mathematics is difficult	Disagree (ref.)					0.11
		No opinion	0.3160	1.37	(0.75	2.50)	0.30
		Agree	0.6900	1.99	(1.04	3.81)	0.04
	Maths is one of my best subjects	Disagree (ref.)					0.00
		No opinion	-0.9300	0.39	(0.21	0.76)	0.01
		Agree	-0.9900	0.37	(0.20	0.70)	0.00
	Maths is Interesting	Disagree (ref.)					0.06
		No opinion	0.5650	1.76	(0.92	3.38)	0.09
		Agree	-0.1690	0.85	(0.45	1.58)	0.60
School	Which school?	School 1 (ref.)					
		School 2	-0.4860	0.62	(0.36	1.04)	0.07
		Constant	0.1190				

Whilst the questionnaires formed the most substantial part of this research, the interviews also offered insight into the students' experiences of maths and what they thought would affect them when learning. Across the interviews there seemed to be a pattern in the way the students evaluated their ability and confidence. For example, a student who labelled herself as 'not confident' explained it was "because everyone's just like better at maths than me." As a result she tended to withdraw and disengage. Many of the students seemed to measure their ability as compared to their classmates. Similarly another student demonstrated the impact of low confidence on their level of engagement; "I've never been much of a confident speaker to a lot of people which is why I don't really bother."

On the other hand another student who expressed high confidence within their class stated there is, "no need to get embarrassed so if you get a question wrong or anything … its not just you whose gonna

get a question wrong." This student demonstrated a far higher level of engagement. The clear differences between students of high and low confidence indicate the effects of confidence and maths anxiety on a student's ability to fully engage with their maths work.

Ability grouping was also addressed in the interviews. One student described how she had been moved to a higher ability group and felt that she was more confident in the lower group than in the higher. When asked to elaborate she said, "because it was like easier … I know what to do." This seems consistent with the previous finding that those who think they are in the right group tend to be more confident – though perhaps in this instance there is a grace period needed to familiarise herself with the new class.

Interviewees were also asked about their relationship with the teacher and whether they felt this affected their confidence. All believed it had a strong influence on how confident they were. One student stated that "it does affect you 'cos like the subjects I'm doing well in I like the teacher … it just doesn't really help if you don't get on with the teacher." This view was consistent across all the interviews.

In addition students were asked about other factors, such as gender, but no other factors, other than those stated above, suggested any influence on whether a student would experience maths anxiety.

These interviews demonstrated consistency with the previous results shown. The most influential factor related to ability grouping and students' opinion of the appropriateness of their group to their ability. For the interviewees, negative opinions of maths and maths teachers impacted on their level of engagement.

Discussion & Conclusion

The teaching of mathematics has been central to the school curriculum in British schools for some time. Due to the nature of maths and the method in which it is taught there is often found to be an imbalance between an individual's *actual* ability, their *perception* of their ability and their *confidence* when using numbers and mathematical concepts. These aspects can cause many to experience 'maths anxiety' (Newstead, 1998), the focus of this investigation.

The aim of this research was to investigate various themes found to affect maths anxiety and to discover which has the most effect. To do this a questionnaire was distributed to students in years 7, 8 and 9 of two secondary schools in North Yorkshire. To complement the questionnaires, interviews were conducted to add depth and understanding.

Demographics demonstrated an effect, particularly relating to social class. Solomon (2007) noted that social class could affect how

students engage with maths and construct their identity. In these schools those pupils of high social class were more likely to be anxious than those from low social class background. This could be related to higher expectations made by parents of students in high social class, it could be interesting in the future to look into reasons behind this.

Pupil identity was highlighted, particularly during the interviews. Black (2004) suggested that the teacher's expectations and the interactions experienced by the students can have a strong effect on their engagement, experience and identity in relation to maths. There was a suggestion that how anxious a student is could have a strong impact on how much they participate and therefore on how they identify themselves. Interviewees expressed the opinion that their relationship with their teacher affected their confidence and enjoyment of maths.

Gender has a huge volume of literature focusing on how it can affect students and their education. In this study, in a simpler model, there was a suggestion that girls were less confident, but when other variables were taken into account any visible effect became smaller and not statistically significant. It could be that the reason girls are less confident is that they are more likely to have negative perceptions and beliefs and/or more likely to think they are in the wrong group. The lack of significant data could be due to the relatively small numbers involved in this research or could be indicative of changes in society. In a larger study, looking into gender effects could provide deeper insight into what the actual relationship is between gender and anxiety.

Ability grouping showed a clear pattern and had a strong impact on whether a student believed they were in the right group and consequently their level of confidence, or maths anxiety. Similarly there also seemed to be an effect depending on which group the students was in, though not as strong. This is consistent with Boaler (2000) who found that many students were uncomfortable with the set they were in. This relationship could perhaps occur due to a move between sets being unexpected and new territory as opposed to whether the student believes they are capable of achieving within a higher or lower class. It could be beneficial to both the pupil and the school to gradually ease a student into a new class and to include them in the decision making process.

Teacher-pupil interactions were highlighted as a relevant factor in the engagement and enjoyment experienced by students in school. Interviews indicated that this was true and would be worth conducting further research. It could be particularly relevant to consider which pupil was taught by which teacher as this could highlight a pattern

and therefore provide some explanation to the pupil's response and level of anxiety.

Perceptions and beliefs have been found to influence a student's engagement. The responses demonstrated that many of the students have a negative perception of maths, which, as suggested by Schoenfeld (1989) is likely to lower the likelihood that they will engage and succeed in maths and is likely to raise their anxiety levels.

Different types of anxiety were briefly touched upon with the finding that students were overall more anxious when answering question in public. There would though be merit in extending investigations on different types of anxiety in further research.

Criticism for this investigation can help to better develop the research and produce useful and practical information for schools. The main criticism regards the size of the study and the demographics of the students. It is difficult to generalise the results of this study given that only two small schools were used from North Yorkshire. In addition the age range of the students was fairly limited but this was a restriction placed on the research by the schools who were only willing to make specific school years available to the study. Age itself could be a factor when predicting a student's level of anxiety. Therefore future research would be greatly enhanced by increasing the number of schools and broadening the age range.

Similarly the questionnaire and interviews could be greatly improved through more precise questioning that avoids ambiguity, particularly when considering a student's confidence to attempt a maths problem regardless of their ultimate success. Not all of the questions effectively measured a student's level of anxiety, further study into maths anxiety would benefit from a more efficient questionnaire. Ultimately the entire questioning process could be developed and improved so as to encourage more revealing results. There are a multitude of seemingly small factors that can affect the student's response such as how the question is worded, where the questions are answered and who supervises them during completion. These are things that could be controlled and will help the researcher produce more reliable results.

Despite this criticism there is some useful information that could be implemented in a school environment as there is useful data indicating who would benefit from extra care and attention. For example, those in a higher social class, those with poor perceptions of maths and students who seem unhappy with their class could all potentially achieve more if given more focus. There is scope for development; looking further into ability grouping would clearly be of use from a practical perspective. Similarly there were some factors

that seem to have a small effect but by doing a larger, more in-depth study it might be possible to determine a clearer pattern.

To conclude, the strongest influence came from which ability group students were in and whether they believed it was the right group for them. Those who thought they were in the wrong group were much more likely to be anxious than those who thought they were in the right group. The message then is there might well be merit in teachers checking whether students believe they are in the right group and explaining why decisions on student set membership have been made.

Further investigation, which perhaps includes the local state 'grammar' schools, would enhance this research. Overall more research looking at factors affecting and measuring anxiety and possible ways to diminish levels of anxiety would be highly useful for schools trying to lower their students' anxiety levels and raise their maths results.

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