# What is it about mathematics that causes anxiety for pupils?

**Bethanie Matthews** and **Nasreen Majid** share some research findings

This small-scale research study explores what it is about mathematics that causes anxiety for pupils. Despite existing research on the causes and effects of mathematics anxiety, evidence looking at mathematics itself was absent. The methods used to elicit an insight into mathematics anxiety took the shape of a drawing task as well as a questionnaire.

## Background to mathematics anxiety

Mathematics anxiety, 'a negative emotional reaction to situations involving mathematical problem solving' (Young, Wu, & Menon, 2012, p. 1), is estimated to affect 'a quarter of the population' (Brian, 2012) and can arise in a variety of situations which involve mathematics. During a child's early development, they are reliant on innate learning behaviours to enable survival and further development. Eligio (2017) states that there are three learning behaviours children can learn this behaviour through; modelling, information transfer and reinforcement. The study further illustrated that if a child repeatedly shows signs of distress when faced with a mathematical stimulus and is subsequently removed from the environment or given a reward once they are back on task, individuals may repeat the behaviour as a way to gain further attention from adults. This may lead them to repeat this negative behaviour when they do not feel that way.

## Cause and effects of mathematics anxiety

The exact cause of mathematics anxiety has not yet been identified. However, current research and evidence points to a relationship between the pressure to learn and master mathematical concepts and the development of mathematics anxiety (TED-Ed, 2017, 2m:05s). For some children, not understanding the learning and moving on to new material can be a worrying process as they may feel that they cannot ask for help, therefore exacerbating the problem. One of the most severe effects of MA is Trichotillomania – a behaviour associated and induced by anxiety (Odlaug, Kim, & Grant, 2010; Grant, 2012; Alexander, et al., 2017, NHS, 2018) which is characterised by obsessive skin picking or hair pulling.

## Main findings from the research

The prevalence of mathematics anxiety today is an ever-growing issue, facing both practitioners and society. From the research undertaken in this project, it has been concluded that a range of factors – wider than the subject itself – can cause anxiety for pupils. Data yielded from drawings made by pupils (Figure 1 and Figure 2) provided information as to the prevelance of mathematics anxiety across three year groups and two Key Stages in one Primary School. From a total of 59 drawings completed, nine drawings contained descriptions or marks which imply the maker has mathematics anxiety, with Year 2 containing the highest total. From the nine drawings (15% of the sample), three males and five females were identified. The drawing task yielded further data relating to the perceptions and emotions pupils have towards mathematics. The drawings by pupils whom displayed a moderate

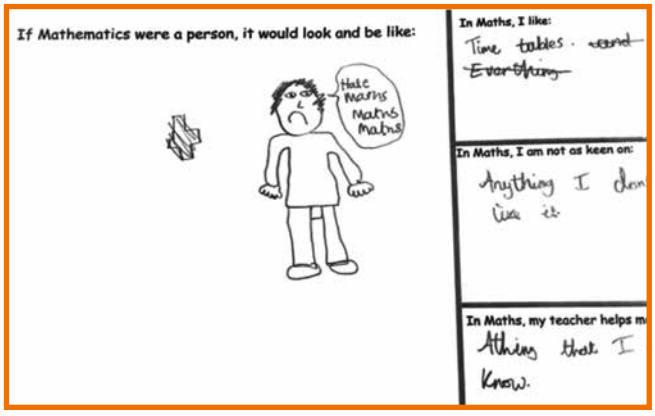


**Figure 1:** Pupil drawing

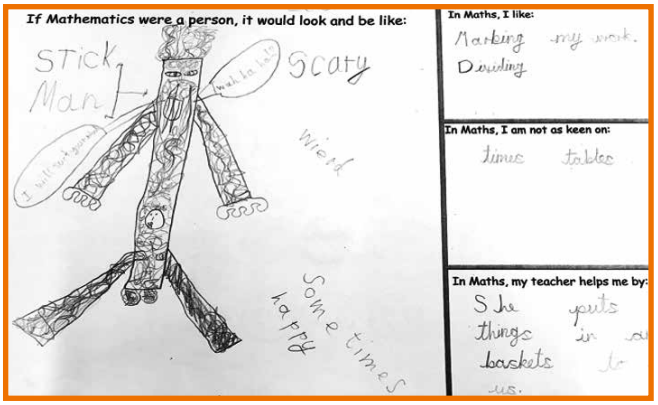


**Figure 2:** Pupid drawing

level of mathematics anxiety were distinguishable by the inconsistency of their responses. Descriptions included "sometimes evil", "sometimes she likes maths" and "I like maths/I don't like maths". In comparison, the drawings by pupils whom display a higher level of MA contained descriptions of "scary", "weird", "hate" and "terrified".

From the 75 questionnaires collected, the variance of effects mathematics anxiety can cause could be seen (Figure 3) as well as obtaining first-hand details of experiences participants have had. Results from the questionnaire indicated that a high proportion of teachers (94.6%) had encountered pupils displaying symptoms relating to mathematics anxiety. Following the thematic analysis structure of Neil and Smith (2017), the questionnaire response to 'What signs have children displayed when becoming anxious about mathematics' were grouped into themes and subthemes.

Overall, 39.7% of Teachers included a response which was categorised as 'Emotional Regulation', 38.7% were responses linked to 'Confidence', 12.9% were responses linked to 'Anxious Cognitions' and 8.6% of participant responses were 'Physical

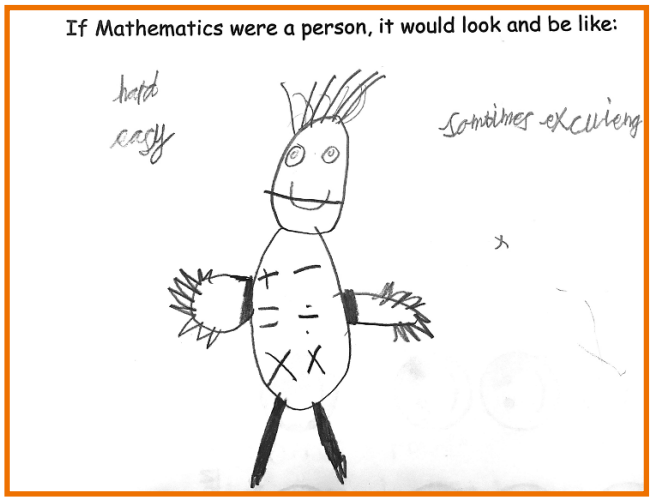


**Figure 3:** Pupil drawing

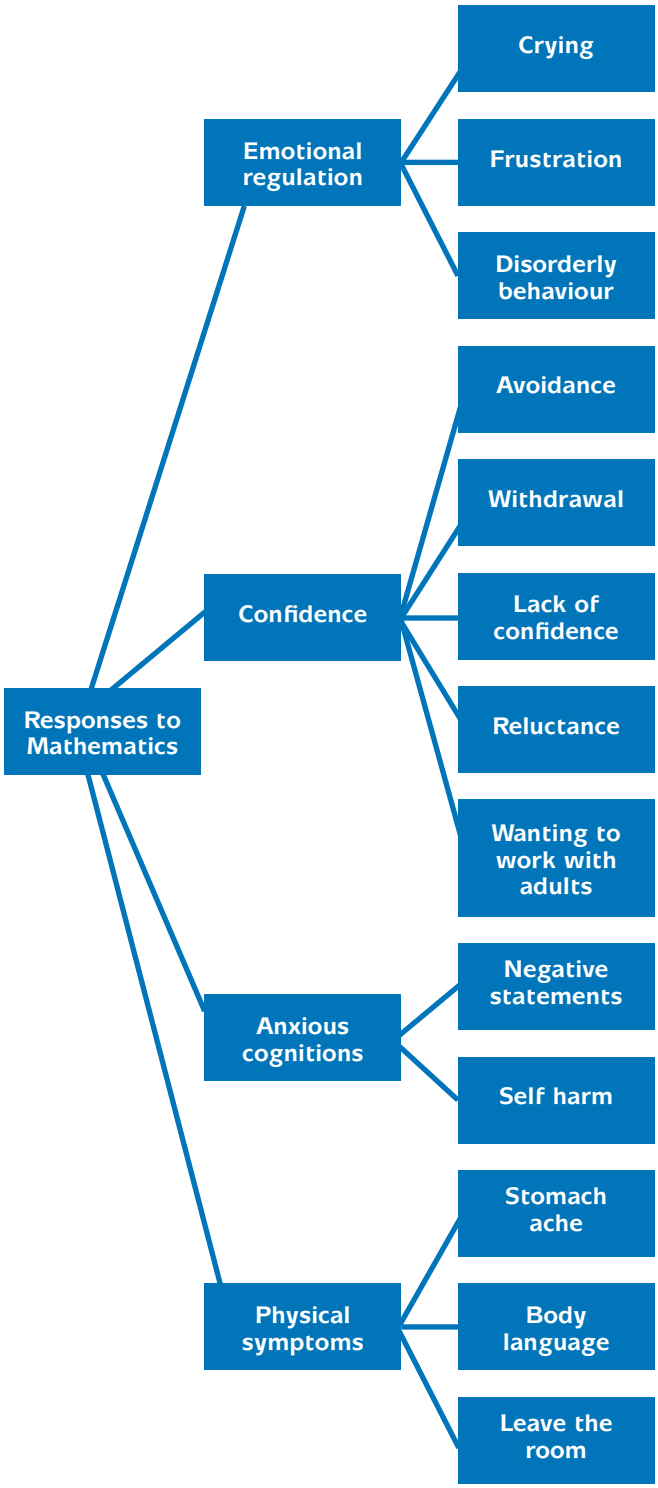


**Figure 4:** Effects of mathematical anxiety on pupils

symptoms' felt by individuals. When exploring the topic content itself, fractions and decimals were the two areas which caused most anxiety for both teachers and pupils. Aside from the content factors which cause anxiety for pupils, getting answers wrong and situations which require fast recall are also responsible for causing mathematics anxiety. To attempt to counteract this, findings from the teacher questionnaire showed that 100% of those

surveyed said they provided a positive learning environment. When asked to specify how, three themes emerged from the data: **teacher attitude**, **resources and lesson content**, and **classroom attitude**. For this question, participants were able to provide as little or much detail as possible, and a multitude of responses contained more than one theme. Of these three themes, 56% of responses related to **resources and lesson content**. Examples of these were: "lots of pictorial and concrete resources', "interactive working wall", "practical activity" and "real life application". This supports the findings of Haylock (2011) and Karpicke (2012) who denote that the use of meaningful contexts and stimuli will reduce retrieval anxiety. The second most frequent method of creating this environment for learning is through the attitude pupils have within the classroom.

**Classroom attitude** responses (52%) referred to different techniques in order to promote a positive attitude to learning. For example, descriptions included: "growth mindset", "encourage all answers, nothing is wrong", "ensuring they know that getting things wrong is ok" and "no contribution is left unvalued." Notions such as these are formed from Dweck's (2000) principle of growth mindset which is centered on a positive learning attitude. Contributing to this, is the final theme with the smallest proportion of responses (10.6%), **teacher attitudes**. Descriptions of these responses include: "being positive myself", "bringing my enthusiasm" and "my love of the subject is contagious."

Overall, it can be concluded that to understand and develop strategies to reduce mathematics anxiety, it is important to not look intrinsically at the content – rather to look at the teaching as a whole, such as classroom environment, attitude of the teacher and the content.

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