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HOW DOES MATHEMATICS ANXIETY IMPACT THE AGE GROUP 13-16?

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ABSTRACT

Mathematics is necessary for our everyday lives, as we can see it and use it everywhere in this world, whether it's the Fibonacci sequence in the petals and seeds of a plant or the motion of a truck along a slanting slope. mathematics prevails in every part of our lives. But the importance and prestige of mathematics are accompanied by the pressure and anxiety students face, because of the pressure of adults and society on how crucial it is. In this paper, we have worked out how an individual's working memory affects their anxiety and performance in this field, and which parts of the human brain are deemed active during these activities.

keywords: mathematics, anxiety, working memory

Introduction

Mathematics is one of the most influential things in our modern society. And we face it from the beginning, whether it is reading a clock, comparing numbers or counting. And a child needs to construct a strong foundation from the beginning, for future mathematical concepts. A toddler must create thoughts and explanations about mathematics that cannot be taught directly. Many of these fundamental notions are formed as a result of interactions with the environment and the people in it. These exchanges are the key to developing an ideal basis for what to come ahead in preschool, kindergarten, high school and eventually college and universities. Researchers have said that sophisticated mathematical skills like order and sequence, seriation, comparisons, classification, adding, and others have their origins before the age of five. And it is interesting to see that most research on this topic is done on students who are in middle and high school, rather than students on an elementary level. The conceivable reason for this is that as children grow up, the teaching deviates from more of an organic way to more contrived and artificial learning. According to studies, textbooks take over the teaching process in a student's mathematics education, as students grow up. And the focus moves from the building of concepts using the

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student's mathematical reasoning to "teacher-imposed" methods to always obtain the right answer and that too as quickly as possible.

Famous research in the psychological field was done by Liebert and Morris in 1967, where they divided test anxiety, which can be correlated to mathematics anxiety due to most of the pressure being based on marks and failing to understand concepts in class, into 2 very distinct components: "Worry" and 'Emotionality". To dive deeper into this and fully understand this research first we need to understand what these words mean in this particular context. So let us start with "worry", it is the cognitive, meaning mental part, of anxiety. This is what a student thinks about himself when he fails to provide a particular expected outcome he/she hoped or even others expected. They feel that they have let down others and maybe even themselves. This makes them feel judged and think they are not good enough in that area, or mathematics in this context. Which, sadly, brings in introspections of dread and fear allied with self-deprecating thoughts about their performance. And now moving on to the other half of anxiety, "Emotionality ". It is best described as the affective component, which involvesthe feelings a student faces through exams and other testing situations. Like the feelings of nervousness, tension and other unpleasant physiological reactions to not scoring well. And in their research, Leibert and Morris show how these two components add up to anxiety. And later on in 1981, their work was reviewed and it was established that even though these two things correlate, they are very distinct, yet "Worry" relates more strongly than "emotionality" to poor test and class performance in all subjects, including maths.

And there have been many researchers and scientists who have made scales to particularly measure mathematics anxiety. Like Dreger and Aiken made a 3-item mathematics anxiety scale, in 1957, to examine reactions to mathematics, whether stressful or relaxing. Another famous scale is the MARS (mathematics Anxiety Rating Scale) made by Richardson and Suinn in 1972. It was specifically designed to assess and record anxious reactions people have when they have to use mathematics in their daily lives or academic situations. And later in 1982, the scale was revised and MARS-A was invented, specifically for children in middleand high school.

Burns in 1998 and Zaslavsky in 1994, both, stated that mathematics anxiety is the probable reason for the negative impact on the students and their achievement in this subject. Regardless of their social and economic background, the majority of individuals in the United States dislike and fear mathematics due to negative interactions and experiences as early as kindergarten and elementary school. Until recently, scientists and educators believed that arithmetic anxiety began when students began to master more difficult mathematics (such as algebra). This would imply that young children who have not yet learned to conduct complex mathematics do not suffer from mathematics anxiety. A recent study has revealed that some youngsters as young as 6 years old express concern about maths. "How do you feel when taking a huge test in your mathematics

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class?" a team of researchers asked 154 youngsters in grades 1 and 2. The kids had to point to a position on a scale ranging from a highly nervous face on the left to a calm face on the right to indicate how nervous they were. After answering these questions, the kids took a mathematics test to see how good they were at maths. Nearly half of the youngsters who took part in the study reported they were at least somewhat apprehensive about doing arithmetic. Additionally, students with higher levels of arithmetic anxiety scored lower on the mathematics test. According to this study, children develop mathematics anxiety and the association between mathematics anxiety and mathematics competence while they are very young.

Discussion, Aim, objective

We need to understand what is going on in the brain while a person with mathematics anxietyis practising mathematics in order to better understand how mathematics anxiety develops and even more, how to help those who suffer from it. One of the most influential theories is that the human brain is finite in how much information it can process at once, and this is known as the individual's working memory. It refers to a system in the brain that enables us to process information. And a component of the memory system facilitates us to recall and think about multiple things at once and thus allows us to multitask, of course to a certain extent. When doing maths, this ability is crucial and vital. An example of this would be when an individual is reading a mathematical problem, he/she has to do multiple actions at one time, one being to hold and remember all the numbers in their mind, and the other being to find a possible way of working the problem, as in the steps to solve it. And finally, he/shealso has to write the answer at the same time. So it involves the brain in 3 different aspects, memorising and remembering, cognition and solving, and most importantly the physical and bodily aspect.

Researchers hypothesise that when people experience arithmetic anxiety, some of their working memory may be consumed, leaving them with insufficient working memory to complete the mathematics issue. If those people didn't feel so nervous, perhaps the working memory that is being used for the anxiety might have been used for solving the mathematics issue. In other words, mathematics anxiety prevents pupils from using their working memory resources to solve arithmetic problems because it prompts them to think and worry about howterrified they are of maths. Research studies have validated the notion that mathematics anxiety involves working memory. It's significant to note that research has shown thatchildren with high levels of working memory do better on arithmetic tests than children with low levels of working memory.

In research by Engle, in 2002, it was stated that typically, individuals with higher working hours. And memory has better performance in scholarly work and problem solving and logic. Conversely, lower working memory individuals are assumed to have a limited capacity for problem computations, to begin with, meaning that consumption of working memory caused by

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anxiety may reduce this available capacity below the level necessary to handle challenging problems successfully.

However, the relationship between mathematics anxiety and the arithmetic performance of people with lower and higher working memory can be predicted less obviously. In particular, higher-working memory people may be more prone to poor performance due to mathematics anxiety. High-working memory students' performance may be vulnerable to anxiety if they largely rely on working memory taxing their problem-solving techniques when mathematics anxiety especially targets the working memory system. In contrast, pupils with low working memory may rely on heuristics or shortcuts to solve arithmetic issues exactly because theyare unable to hold complex problem-solving procedures in working memory. According to this theory, low-working memory students would in a sense have nothing to lose in comparison to high-working memory students if worry had a negative impact on the working memory system.

For instance, Beilock and Carr, in 2005, required high and low-working memory individuals to finish a block of mathematics problems under low pressure and then under high pressure, which was intended to toy with people's anxiety levels. Students with strong working memory outperformed those with poor working memory in terms of accuracy when there was no pressure. This served as a control group. The mathematics performance of high-working memory kids, however, was equal to that of low-working memory students when they were forced to complete a similar block of questions under extreme time constraints, thus creating pressure and performance anxiety. It's important to note that these benefits only applied to challenging mathematics tasks that demanded the greatest working memory. Based on these results, it was anticipated that young children with high working memory may be more susceptible to underperforming in mathematics due to self-reported mathematics anxiety. Therefore, it was hypothesised that, if mathematics anxiety is present in the young study population, it will have a negative impact on mathematics achievement, especially in high-working memory children.

But to be clear of any confounding variables and to make the experiment 100% independent variable-dependent variable study, meaning that the mathematics anxiety only and specifically relates to mathematics achievement and not some other variable like general academic anxiety. And to establish this Gerardo Ramirez, Elizabeth A. Gunderson, Susan C. Levine, and Sian L. Beilock continues this experiment by requesting that students complete a reading comprehension assessment and a mathematics proficiency assessment. In contrast to reading achievement, they predicted that higher-WM kids would exhibit a negative relationship between self-reported mathematics anxiety and mathematics performance.

It is also important to focus on the biological aspect of mathematics anxiety and how the brain is stimulated by actions and functions. Researchers discovered that children with high mathematics

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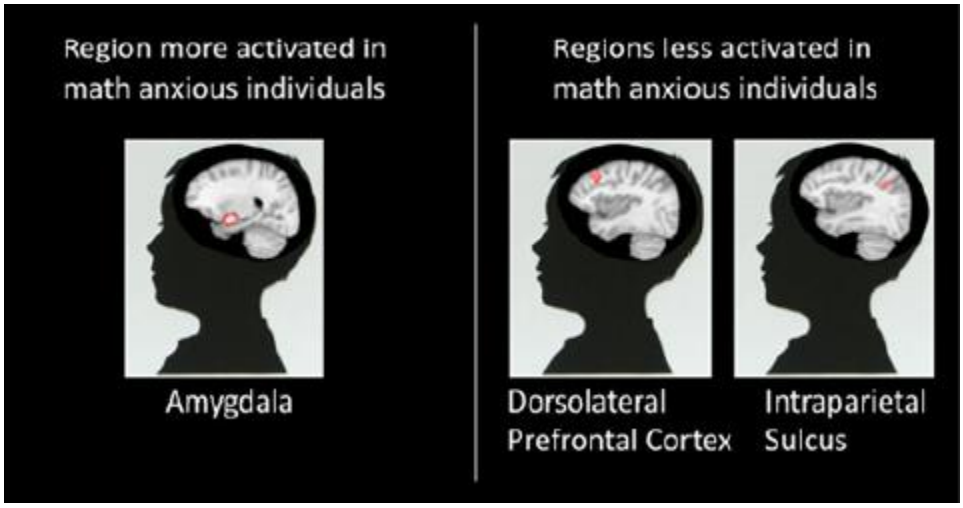
anxiety have an amygdala that is more active (working harder) than children with low mathematics anxiety. Additionally, compared to children with low mathematics anxiety, children with high mathematics anxiety had less active (working less hard) dorsolateral prefrontal cortex and intraparietal sulcus brain regions, which are responsible for working memory and arithmetic processing. For feeling and processing emotions, such as fear and anxiety, the amygdala, a little almond-shaped structure in the lower centre of the brain, is crucial. A larger portion of the brain in the front of the brain called the dorsolateral prefrontal cortex is responsible for many complex functions like planning and decision-making. mathematics and paying attention requires the intraparietal sulcus, a part of the brain located at the top of the brain. Overall, this implies that when kids solve arithmetic problems, kids with high mathematics anxiety engage brain areas associated with anxiety, while kids with low mathematics anxiety engage brain regions associated with mathematics problem-solving.



Finding solutions to assist those who experience mathematics anxiety and ultimately preventing it from occurring is one of the key objectives of studying what causes mathematics anxiety and how mathematics anxiety impacts the brain. To assist those who struggle with arithmetic anxiety, some researchers have developed aids, also known as"Interventions". A programme or tool that is provided to individuals with the intention of assisting them in developing their skills. For instance, academics have developed therapies based on research demonstrating that pre-writing thoughts and feelings can reduce test-taking anxiety. Researchers hypothesise that if kids wrote down their feelings and thoughts, such emotions wouldn't interfere with their ability to focus on an arithmetic test.

Therefore, the researchers conducted an intervention in which they requested writing from maths-anxious kids. These researchers discovered that when students expressed their concerns about arithmetic in writing, their exam results, in maths, improved. A third team of researchers

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found that college students with mathematics anxiety who practised breathing techniques to reduce their stress before a mathematics test felt less anxious and performed better on the test. Together, these intervention studies offer solid proof for mathematics anxiety treatment strategies. The fact that persons with mathematics anxiety can be healed and are not doomed to suffer from it forever makes this research highly encouraging.

I believe that to deal with mathematics anxiety and not letting it happen, meaning eradicating the very root of it is very important. To do this, the community, especially the parents and teachers need to understand that everyone has their own learning capability and learning style, and it is important to let them work out problems on their own, instead of throwing formulas, problems and tests on them. By doing this, the students won't feel the pressure they feel now, with the pressure of learning just for the sake of it, instead, it is important to let them understand it more naturally and realistically, like learning it in real life.

Conclusion

Numerous researchers have sought to understand more about mathematics anxiety because it is known that those who struggle with it suffer difficulties in their mathematics classes, careers, and daily life. In this field, research is still advancing.

Mathematics anxiety has been linked to social circumstances, working memory, and early development in children, according to research. Additionally, those who struggle with mathematics anxiety have less activity in the parts of their brains that are used for mathematical thought and greater activity in the parts of their brains associated with negative emotions. To learn how mathematics anxiety first manifests, why some people only experience it, and how we can support those who experience it, there is still a lot of research to be done. For the time being, whether you struggle with mathematics anxiety or not, talk to your professors and fellow students about it. The first step in assisting in reducing the potentially negative impacts of mathematics anxiety is to have dialogues about your emotional responses to maths.

References

- https://www.researchgate.net/profile/Allan-Wigfield/publication/232599119_Math_Anxiety_in_Elementary_and_Secondary_School_Students/links/02bfe50ef063d8f42f000000/Math-Anxiety-in-Elementary-and-Secondary-School-Students.pdf
- http://mrbartonmaths.com/resourcesnew/8.%20Research/Anxiety/Math%20Anxiety,%20Working%20Memory,%20and%20Math%20Acheivement.pdf
- https://www.andrews.edu/sed/gpc/faculty-research/montagano-research/the-anti-anxie ty-

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- https://ncbi.nlm.nih.gov/pmc/articles/PMC3462591/
- https://kids.frontiersin.org/articles/10.3389/frym.2017.00057

