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Math anxiety – When the emotional brain paralyzes the thinking brain***

Summary

Math anxiety as a mental and even physiological condition that occurs when confronted with math problems may be associated with a negative attitude towards math and difficulties in performing math activities. It manifests itself as an emotional response to a perceived threat in the form of mathematical stimuli, resulting in a state comparable to that experienced in the other forms of anxiety disorders. Over the last years, math anxiety as an issue in education attracts increased attention from both educators and researchers, emphasizing the importance of emotions in the learning process. This review article presents a literature study that aims to provide an overview of the research of the field, ranging from the initial studies of the concept of math anxiety to the latest research exploring the mechanisms of manifestation of math anxiety in the example of studies of brain activity under mathematical stimuli. Moreover, the review describes the most studied family, school, and social factors that have been claimed to play an important role in the origin of math anxiety, also the tools used to measure the level of math anxiety in different age groups. Finally, it examines the main proposed explanations of the relations between math anxiety and students' math achievement.

Keywords*:* math anxiety, emotions, working memory, gender stereotype, brain activity, math achievement

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Introduction

Emotions play an important role in the learning process influencing students and teachers (Pekrun et al., 2010); research pay more attention to negative than positive emotions since they are implying a negative impact on academic performance. Experiencing strong, upsetting emotions is often accompanied by a feeling of being unable to think clearly. Therefore, when an individual experiences constant emotional distress, this can lead to the "paralyzation" of learning abilities. Not always is intellectual potential decisive for academic achievement; if the control over emotions is impaired, it can lead to crucial problems for learning. One of the most studied emotions in the context of education is anxiety (Pekrun et al., 2002). Moreover, researchers have begun to describe anxiety associated with a variety of subjects such as chemistry, foreign language, etc. (Horwitz, 2010; Kurbanoğlu & Akin, 2012). However, most of the research is devoted to math anxiety, since math is often considered the most strenuous subject in the curriculum that can cause strong emotions (Ashcraft & Ridley, 2005).

Math anxiety is a mental and even physiological condition that occurs when confronted with mathematical stimuli, accompanied by a negative attitude towards math (Dowker, Bennett & Smith, 2012; Kucian et al., 2018) and difficulties in performing math activities (Hembree, 1990; Ma, 1999; Zhang, Zhao, & Kong, 2019). Research claims that worrying during performing math tasks uses up the brain's energy for processing negative emotions, loading up working memory and leaving little place for thinking about tasks regardless of math abilities (Ashcraft & Kirk, 2001; Ashcraft & Krause, 2007). Some studies suggest that inherently weak math abilities such as abstract thinking, visuospatial processing, and "number sense" may be the cause of the subsequent development of anxiety when interacting with math (Eden, Heine, Jacobs, 2013; Ferguson et al., 2015; Maloney, Ansari, & Fugelsang, 2011). Conceivably, the weakness of these abilities can be a genetically determined factor. Nevertheless, math anxiety as an affective factor can also be contributed to or facilitated by external conditions.

Evidently, research indicates that math anxiety is negatively correlated with academic outcomes (Hembree, 1990; Ma, 1999; Zhang et al., 2019). Moreover, it is not only associated with immediate negative affective reactions influencing math achievement but also has harmful long-term consequences for career choice and professional success (Ashcraft, 2002; Eispino et al., 2017). However, research indicates that math anxiety may differently impact math achievement across individuals varying in their intrinsic math motivation (Wang et al., 2015). For instance, lack of motivation coupled with math anxiety can cause avoidance

behavior that is, avoiding any situations related to mathematics. Conversely, high motivation can help overcome negative emotions associated with math.

The current literature study addresses the concept of math anxiety and discusses the mechanisms of manifestation of math anxiety in the example of studies of brain activity under mathematical stimuli. The article describes the most studied possible causes of the development of math anxiety, also the measurement instruments used for different age groups. Finally, it examines the main proposed explanations of the relations between math anxiety and students' math achievement.

The phenomenon of math anxiety

Research on math anxiety began in the 1950s when Gough (1954) first used the concept of "mathemophobia" to describe conditions similar to a phobia but related exclusively to mathematics (Gough, 1954). The first definition of math anxiety dates back to 1957 – "the presence of a syndrome of emotional reactions to arithmetic and mathematics" (Dreger & Aiken, 1957, p. 344). Currently, several definitions of math anxiety can already be distinguished. For instance, "feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic settings" (Richardson & Suinn, 1972, p. 512), "the panic, helplessness, paralysis and mental disorganization that arises among some people when they are required to solve a mathematical problem" (Tobias, 1978, p. 65), "a general fear of contact with mathematics" (Hembree, 1990, p. 45), or "a feeling of tension, apprehension or fear that interferes with math performance" (Ashcraft, 2002, p. 181).

In general, all these definitions can be divided into two types: (1) some emphasize academic performance (feelings of tension, apprehension, or fear that affect performance); (2) others focus on experienced feelings (a state of distress that a person experiences when interacting with math) (Chinn, 2009). It is also worth paying attention to the fact that some definitions indicate that math anxiety is not a problem that manifests itself only in students during learning math at school or university. Often people in adulthood may experience anxiety about math or numbers in ordinary life, in situations when there is a need to perform any arithmetic calculations, for instance, calculating a change in a store or a utility bill, etc. As the study has shown, adults who had completed graduate school or had a STEM (science, technology, engineering, and mathematics) career had significantly lower levels of math anxiety than did those with less education, or non-STEM careers (Hart & Ganley, 2018). It can be assumed that study participants

suffering from math anxiety, initially, at the beginning of formal schooling, chose to have less interaction with math.

Manifestation mechanisms

Nowadays, the math anxiety phenomenon has attracted the attention of not only researchers but also of teachers and parents, sometimes students themselves show an interest in understanding the causes of excessive anxiety or difficulties in math classes. In this regard, the question often arises: how to distinguish math anxiety from just a dislike toward math or a negative attitude toward math that can arise, for instance, when math seems rather abstract. The main difference can be explained in the specific type of response, since anxiety as an affective factor may cause feeling restless and tense, sweating, having a rapid heartbeat, etc. As for the attitude toward math, it is to a greater extent based on motivation and cognition (Dowker, Sarkar, & Looi, 2016). However, these indicators have a strong correlation (Hembree, 1990; Hoffman, 2010). Similarly, as with math performance, it is difficult to establish a causal relationship: does anxiety lead to a negative attitude to math or vice versa?

How do we understand if it is real anxiety? The measures for assessing math anxiety include questionnaires and rating scales. Studies have shown that these tools have good psychometric properties for determining math anxiety. However, any survey in the form of self-reports may have its limitations, often respondents are not entirely accurate in their self-perception and these tools are not the realtime assessment of situational anxiety responses, this affects the overall assessment of the presence of such a state as anxiety. Studies of the neurobiology of math anxiety allowed us to understand better what exactly happens to a person suffering from math anxiety.

One of the most discussed studies has shown that the expectation of a math problem increased activation in the pain perception network, including the bilateral dorso-posterior insula and mid-cingulate cortex, in adults with high levels of math anxiety (Lyons & Beilock, 2012). The authors of this functional MRI study point out that the reaction to the experience of pain was observed precisely during the anticipation of the upcoming math task, but not during the execution of this task. These results may indicate that the affective component, such as anticipating a dreaded event, is a real manifestation of anxiety, in this case, caused by math.

Another functional MRI study, in which the participants were children aged from 7 to 9 years old, showed that high math anxious individuals showed hyperactivity and abnormal effective connectivity in the right basolateral amygdala (Young, Wu, &

Menon, 2012). The amygdala is a brain area related to processing negative emotions and frightened or fearful inputs (Phelps & LeDoux, 2005). Moreover, it is studied in the context of the pathological processes of anxiety disorders (Rauch, Shin, & Wright, 2003). The authors also found that children with high math anxiety showed reduced responses in cortical and subcortical areas that are associated with mathematical and numerical reasoning. Notably, these results also point to a parallel between math anxiety and other specific types of anxieties and also emphasize that fear about math is a specific form of situational anxiety. A recent study has shown that math anxiety is even linked to changes in brain structure and, as the author points out, it is proof that math anxiety in children is real (Kucian et al., 2018). The structural changes have been detected in the amygdala, which is characterised as a key area in the brain for negative emotional processing such as fear, stress, and anxiety. Directionality between reduced amygdala volume and stress was shown in previous studies (Roozendaal, McEwen, & Chattarji, 2018). However, the study has a limitation – lack of assessment of general anxiety or test anxiety among children, since the reduced amygdala volume could be related to anxiety in general, rather than math anxiety in particular.

Another research that involved children was the interventional study with brain imaging that also demonstrated activation of brain circuits that are related to negative emotional possessing in children experiencing math anxiety (Supekar et al., 2015). The main idea of this study was to test how successful eight weeks of cognitive tutoring could be in reducing high levels of math anxiety. The results showed that children with high levels of math anxiety experienced significant reductions in anxiety after tutoring. Besides, math tutoring normalized hyperactivity and functional connectivity of the amygdala in highly anxious children to the level of their less anxious peers.

The results of these studies give grounds to consider math anxiety as a separate psychological feature that manifests itself directly when interacting with math. Moreover, math can cause real anxiety, specifically the state when a person experiences emotional discomfort associated with the expectation of some danger that similarly to anxiety disorders most often occurs without the presence of real threatening conditions.

Possible reasons for math anxiety

The question of the possible reasons for the development of math anxiety remains open. Numerous studies are devoted to identifying the causes of its occurrence. As for math ability, some researchers associate math anxiety with

genetic conditioning. Wang and colleagues (2014) in their empirical research study found that genetic factors account for about 40% of the variation in math anxiety, and the remaining variation is explained by child-specific environmental factors (Wang et al., 2014). Overall, the results of this study indicate that the development of math anxiety may be associated with genetic risk factors for both general anxiety and math cognition. A later twin study found similar results (Malanchini et al., 2017). This suggests that hereditary factors, the so-called genetics, undoubtedly have weight, but it is commensurate with environmental factors.

The study of environmental factors begins with the study of home experiences around math. Some studies have shown that parental math anxiety influences the development of their children's math anxiety (Casad, Hale, & Wachs, 2015; Daches & Rubinsten, 2017; Maloney et al., 2015). Maloney and colleagues (2015) found that children whose parents have a high level of math anxiety learn significantly less math during the school year and experience math anxiety, but only in case their parents help them with their homework, compared with those children whose parents do not experience math anxiety or do not often help children with math homework. Daches and Rubinsten (2017) also found a significant correlation – when levels of mothers' math anxiety are higher, their children exhibit lower intrinsic motivation, poorer arithmetic skills, and higher levels of implicitly measured math anxiety. Another study found that increased levels of math anxiety in fathers were moderately associated with math anxiety in first grade children, but not significantly correlated with math achievement (Szczygiel, 2020). Moreover, the author specified that the math anxiety of mothers and teachers directly predicts the math achievement of children by the final grade of early school education but is not associated with math anxiety.

Commonly, a child receives most of his or her mathematical knowledge in the classroom, which means that the next external factor, presumably influencing the development of math anxiety, is interaction with a math teacher. As it turned out, the problem of anxiety about math is inherent not only to students but also to teachers. For instance, some studies have shown that teachers experiencing anxiety use teaching methods or techniques such as rote-type learning instead of more conceptual methods (Vinson, 2001). Moreover, teachers with math anxiety do not feel effective while teaching the subject (Gresham, 2008). All of these examples can have an impact on how students feel during the class, and how well they understand what they are simply memorizing. Therefore, when preparing teachers for their work, it is very important to pay attention to the teaching methods, not only to the subject content (Took & Lindstrom, 1998). The study of Ramirez and colleagues showed that higher levels of math anxiety among teachers are associated

with lower math achievements of their students (Ramirez et al., 2018). Another study has even revealed a trend of intergenerational transmission of math anxiety between female teachers and female students (Beilock et al., 2010).

Another factor related to the development of math anxiety, which has been the subject of an impressive body of research, is gender. Studies show that female students most often report higher levels of math anxiety (Else-Quest, Hyde & Linn, 2010; Hembree, 1990; Hyde et al., 1990). The most common explanation for gender differences is the so-called stereotype threat (Steele, 1997). A gender stereotype in math is the belief that men are better at math than women (Cvencek, Meltzoff, & Greenwald, 2011; Stoet et al., 2016). The reason for the emergence of such a stereotype is that children of a different gender from birth focus their attention on different aspects in different ways. For instance, it is believed that boys pay more attention to objects and the mechanical connections between them, while girls pay more attention to emotions and interactions with other people. We also see men more often than women as pioneers in mathematical and technical sciences. However, a recent study of gender differences between girls and boys among Swedish students showed that boys prefer group work more than girls (Samuelsson & Samuelsson, 2016). Also, boys indicated that they influence the content of the lesson and are more involved in the lesson than girls. However, when it comes to student attitudes towards math, it was found that boys consider math as an important subject more often than girls.

Gender differences can be found in young children and have a tendency to increase with age (Dowker et al., 2012). A negative stereotype affects learning behavior as well as math anxiety through increased stress and decreased performance. An interesting study reveals that female students performed worse if they were told in advance that an upcoming test was expected to be more difficult for women than for men (Spencer, Steele, & Quinn, 1999). Interestingly, however, higher levels of math anxiety in women contrasted with the absence or insignificant presence of gender differences in average math performance (Lindberg et al., 2010).

As some studies have shown, the culture and socio-economic conditions of individuals and countries have an influence on academic success in math (Chiu & Xihua, 2008). The relationship between math anxiety and math performance gives us a reason to believe that cultural and socio-economic conditions also influence math anxiety. The researchers concluded that there are certain differences between Asian and Western European countries in this matter (Lee, 2009; Stankov, 2010). Students from Asian countries (such as Japan and South Korea) report high math anxiety and low math self-concept, while students from Western European countries (such as Finland, the Netherlands, and Switzerland) report low levels of math

anxiety and higher self-concept. These results demonstrate cultural differences – in Asia, students have high expectations of themselves and strive for high academic achievement, which can lead to high levels of anxiety; in Europe, students are often less critical of their academic achievement and feel more confident. A meta-analysis by Zhang and colleagues (2019), showed that the relationship between math anxiety and math achievement was stronger among Asian students than among European and American ones (Zhang, Zhao, & Kong, 2019). As mentioned above, in terms of socio-economic development, the higher economically developed countries are associated with better math ability and lower levels of anxiety (Stoet & Geary, 2016).

Measurement instruments

The measurement of math anxiety was first attempted by Dreger and Aiken (1957) using the Taylor Manifest Anxiety Scale (Taylor, 1953) and by adding three math-related items and calling this scale the Numerical Anxiety Scale. However, only in 1972, the first complete diagnostic scale of math anxiety was created – the Math Anxiety Rating Scale (MARS) which consists of 98 items (Richardson & Suinn, 1972). The MARS is a questionnaire of brief behavioral situations related to math that can cause different levels of anxiety. A survey participant only needs to rate the level of emotion by assigning a value from 1 to 5 according to the Likert scale, where 1 is "not at all" anxious and 5 is "very much" anxious.

Since the appearance of the first scale that measures the level of math anxiety, other, shorter, reliable versions of scales have appeared. For instance, the Math Anxiety Questionnaire with 11 items (MAQ) (Wigfield & Meece, 1988), a brief version of the Math Anxiety Rating Scale that includes 30 items (MARS 30-item) (Suinn & Winston, 2003), the 9-item Abbreviated Math Anxiety Scale (AMAS) (Hopko et al., 2003) and many others. Table 1 presents the psychometric properties of some scales discussed in this article. Moreover, developed assessment scales go through a process of pre-adaptation – translation, and exclusion of math-learning situations atypical for the culture in which the research is conducted. For instance, one of the studies evaluated the psychometric properties of the Polish adaptation of AMAS using a large-scale Polish sample (Cipora et al., 2015).

Over time, interest in testing children of early age developed, and it became necessary to create appropriate tests. For instance, the Math Anxiety Scale for Young Children (MASYC) (Harari, Vukovic, & Bailey, 2013) or the Revised Child Math Anxiety Questionnaire (CMAQ-R) (Ramirez et al., 2016). MASYC includes 12 statements of both positive valence – "I like being called on in math", and negative valence – "I get nervous about making a mistake in math". Children need to evaluate their

Table 1. Psychometric properties of some scales that measure the level of math anxiety

№	Instrument	Authors	Number of Items	Target group	Type of rating scale	Reliability
1	Math Anxiety Rating Scale (MARS)	Richardson & Suinn, 1972	98	College students	5-point Likert scale	Cronbach's alpha = 0.97; Test-retest (7 weeks) = 0.85.
2	Math Anxiety Questionnaire (MAQ)	Wigfield & Meece, 1988	11	6^{th} –12^{th} grades	7-point Likert scale	Cronbach's alpha: 1) negative affective reaction = 0.82; 2) worry scale = 0.76.
3	Mathematics Anxiety Rating Scale (MARS 30-item)	Suinn & Winston, 2003	30	College students	5-point Likert scale	Cronbach's alpha = 0.96; Test-retest (1 week) = 0.90.
4	Abbreviated Math Anxiety Scale (AMAS)	Hopko et al., 2003	9	College students	5-point Likert scale	Cronbach's alpha = 0.90; Test-retest (2 week) = 0.85.
5	Abbreviated Math Anxiety Scale (AMAS): Polish adaptation	Cipora et al., 2015	9	University students	5-point Likert scale	Cronbach's alpha = 0.85; Test-retest (4 months) = 0.71.
6	Math Anxiety Scale for Young Children (MASYC)	Harari, Vukovic, & Bailey, 2013	12	1^{st} grade	4-point Likert-type	Cronbach's alpha = 0.70.
7	Revised Child Math Anxiety Questionnaire (CMAQ-R)	Ramirez et al., 2016	16	1^{st} – 3^{rd} grades	5-point Likert-type (pictorial)	Cronbach's alpha = 0.83.

feelings related to math using a 4-point Likert-type scale. CMAQ-R was specially designed to be appropriate for first and second grade children and includes 16 questions about a variety of math-related situations. For instance, questions related to general situations – "Being called on by a teacher to explain a math problem on the board", as well as questions related to nervousness in solving certain math problems. For instance, "There are 13 ducks in the water, and there are 6 ducks on land. How many ducks are there in all?" Children should evaluate their feelings by pointing to one of the emoticons, from not nervous at all (1) to very nervous (5).

Relations between math anxiety and math achievement

The particular interest in the study of math anxiety is certainly related to the fact that such a negative reaction to interaction with math can have consequences for learning outcomes, as emotions play an important role in the learning process. Emotional discomfort can lead to the avoidance of any activity related to math (Ashcraft, 2002). Avoidance behavior is a natural behavioral anxiety reaction accompanied by deficits in the attention control system of anxious individuals. Therefore, subsequently, this can result in a lack of practice that leads to a performance deficit and difficulty in understanding mathematical concepts, regardless of actual math ability. It was also claimed that anxious thoughts that arise during the solution of math problems overload working memory (Ashcraft & Kirk, 2001). Thereby, anxious thoughts make it impossible to concentrate on current mental activity, and of course, the student can be less productive during math class than if he or she would not experience anxiety.

Generally, the working memory capacity correlates with learning outcomes (Bergman Nutley, & Söderqvist, 2017). However, Ashcraft and Kirk (2001) in their study indicated that in the case of math anxiety the effect of low working memory capacity was not a stable characteristic since individuals with high math anxiety experienced a temporary decrease in computational ability when they became anxious, and also when the math task was more complex and heavily dependent on working memory. Interestingly, another study involving elementary school students demonstrated that the negative relation between math anxiety and math achievement was present only for those children having high working memory capacity (Ramirez et al., 2013). It turns out that children with a high working memory capacity, who have a greater potential for high math achievement, suffer the most from the negative effects of math anxiety. The researchers explained this by suggesting that perhaps children with high working memory resources are more likely to use the very problem-solving strategies that load working memory the most.

However, anxiety about math can also arise against the background of initial difficulties in understanding math due to an initial low level of math ability or any other circumstances that result in a deterioration in math performance. In this regard, one of the studies analyzing the causal relationship between math anxiety and math achievement showed, through structural equation modeling, that prior low math achievement appeared to cause later high math anxiety among students, whereas prior high math anxiety rarely caused later low math achievement (Ma & Xu, 2004). According to these results, it can be concluded that, nevertheless, difficulties in math can have a significant impact on the development of math anxiety, more specifically, such a sequence can have negative consequences.

Some research has debated the question of which math abilities may be impaired in people who experience math anxiety. In this regard, studies suggested two impaired abilities that can contribute to math anxiety development, such as poor abstract thinking or visuospatial processing (Eden et al., 2013; Ferguson et al., 2015). Other examples indicate that the presence of math anxiety may be associated with a poorly developed "number sense", which is expressed in the problem of accurately representing a numerical value, in other words, with difficulties in using mathematical symbols, in particular, numbers (Maloney et al., 2011).

Therefore, it is difficult to conclude about arising subsequence – first is math anxiety, or first is math performance deficit. Moreover, patterns of the relation between math anxiety and math performance may differ depending on intrinsic math motivation (Wang et al., 2015). The study found that moderate levels of math anxiety were associated with better performance compared to extremely low and high levels of math anxiety for individuals with high levels of intrinsic motivation. This means that individual differences and an individual approach to math-related situations can encourage overcoming negative reactions through motivation; when lack of motivation further reinforces the negative association between math anxiety and math performance.

Overall, based on the widely known theories on the causality of math anxiety and math performance, the most plausible seems the reciprocal theory (Carey et al., 2015). Since such associations may not be unidirectional relationships, the effect of a so-called "vicious circle" is often inevitable. Here only can be added that it is certainly impossible to identify math anxiety with math performance deficit. Moreover, high math anxious individuals tend to show worse performance when their math achievement is precisely measured with standardised tests (Ashcraft & Krause, 2007). In addition, standardized tests are not capable of assessing a reliable level of math ability, given that math ability is much more than just math achievements.

Conclusions

This review emphasized several critical factors to consider while debating the phenomena of math anxiety. Firstly, the neural mechanism underlying math anxiety demonstrates anxiety-related differences in brain functioning. Moreover, it has been shown that math anxiety can cause structural changes in the brain area responsible for processing negative emotions. Secondly, studies indicate that the causes of the development of math anxiety may be a genetic predisposition, home and school environment including parent and teacher roles, gender differences in the context of the so-called "gender stereotype", age characteristics, and culture. Thirdly, math anxiety interferes negatively with learning outcomes in math and is often accompanied by a negative attitude towards math.

Neurophysiological research has given a better understanding of math anxiety manifestation mechanisms and what exactly happens to a person suffering from it. Negative thoughts seem to paralyze the ability to focus on the math content while forcing thinking about how to avoid math-related situations. Perhaps the question is only in the complexity level of the specific math task. However, neurophysiological studies most often use arithmetic tasks that do not require having deep knowledge of mathematics. Consequently, the activation of the brain areas associated with emotion regulation during math activity may lead to limited capacities and less efficient processing even in simple tasks.

Given that a recent study has found possible structural brain changes in individuals with high math anxiety, another question arises: does math anxiety lead to a volume decrease of the amygdala, or does an inherently smaller amygdala volume predict having anxiety? Perhaps future research will be able to answer this question. However, in general, studies have said a lot about the possible causes of math anxiety. For instance, math anxiety can be explained, at least in part, by genetic factors, but the environment can sometimes completely compensate or, conversely, level out hereditary factors.

Overall, it must be mentioned that anxiety can be seen as a reaction to some unfortunate event that requires an immediate way to deal with it. Therefore, the task of anxiety is to work out in advance the optimal solution when faced with such an event. But when anxiety turns on the emotional brain, it might be difficult to focus on the problem that needs to be solved; instead, all attention is focused on the perceived threat. What threats can arise when performing any mathematical calculations? Probably, anxiety in math class can be associated with a time limit for doing math tests or with the need to go to the board for solving a problem in front of the class, etc. However, math anxiety represents a serious problem for many people for a long time and limits future career choices and professional success.

Is it only anxiousness that is to blame for all of this, or is it a result of a lack of math abilities that has its own set of later consequences? Everyone will agree that the development of math skills plays an important role, and difficulties in doing math can cause a negative attitude towards math. Perhaps that is the reason why interaction with math is comparable to anticipating physical pain? Such associations may not be unidirectional relations, and the effect of a "vicious circle" is often inevitable: negative thoughts about math, less practice – fewer math skills, worse results in math. In addition, the role of intrinsic math motivation is worth considering, since it may be important in how math anxiety affects math performance.

Summing up, reasonably arises a question: is it possible to prevent the development of math anxiety or reduce its negative effect? Nowadays, this issue has been one of the most important in the field that deserves separate attention. In short, considering the relations between math anxiety and math achievement, researchers generally propose either behavioral interventions focused on reducing anxiety reactions or interventions focusing on improving math skills. In addition, research has presented neuropsychological stimulation and even nutritional (sedative tea) methods. Although some intervention studies show promising results, it is too early to confirm that there is an effective treatment for math anxiety. Extensive research is required.

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