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Study on Influencing Factors and Interventions of Adolescent Mathematics Anxiety

Xiangting Liu

School of Science, Tianjin Polytechnic Normal University, No.1310 Dagu South Road, Tianjin,China
FH248365701@163.com

Abstract: Nowadays, mathematics anxiety of adolescents is a common problem in the field of education, but serious mathematics anxiety will have a negative impact on the physical and mental development and academic progress of adolescents . Therefore, this study will analyze and summarize relevant literature on math anxiety, and explore the influencing factors and intervention measures of math anxiety from the aspects of individuals, families and schools. In terms of influencing factors, individuals (gender difference, learning style and personal motivation), families (parent-child relationship and parenting style) and schools (internal school atmosphere and teachers' teaching strategies) will have an impact on math anxiety. Then, this study put forward the corresponding intervention measures for the influencing factors mentioned above. Firstly, in the aspect of individual, cognitive behavioral therapy, intensive breathing training and expressive writing can be used to effectively interfere with teenagers' mathematical anxiety. Secondly, for the math anxiety caused by family reasons, by carrying out math practice activities based on father-son relationship, parents can give their children more full academic support, which can effectively reduce the math anxiety level. Thirdly, from the point of view of schools and teachers, we can effectively intervene the math anxiety level of teenagers by changing the learning environment of students. Finally, the paper also points out the shortcomings and limitations of the existing research, which provides sufficient theoretical support and help for the future comprehensive and in-depth understanding of the overall structure of mathematical anxiety and effective improvement of mathematical anxiety.

Keywords: math anxiety, adolescent, influence factor, intervention

1. Introduction

At present, in the fast-developing society, engineering and scientific skills are becoming very important[1], and the study of mathematics is closely related to the mastery of such skills, so people's demand and attention to mathematics are getting higher and higher[2]. At the same time, proper mathematical knowledge and skills can help people get opportunities in a competitive environment[3]. Therefore, it is very important for adolescents to learn mathematics. Those who can naturally display and skillfully use mathematical skills can get more opportunities and make themselves continue to explore and succeed[4]. However, at present, in some developing countries, many students with academic qualifications at all levels have many defects and difficulties in mathematics learning[5], and at the same time, mathematics is considered as the most difficult

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subject by students of all grade[6]. Therefore, in today's educational circles, the mathematics anxiety of teenagers has become a universal problem[7]. Mathematics anxiety refers to a kind of tension and anxiety that interferes with digital operation and solving digital problems in daily life and various academic situations[8]. When adolescents suffer from math anxiety, some basic activities such as opening a math subject book or entering a math-related class will trigger a lot of negative emotions in themselves[9]. But in fact, math anxiety does not exist in the beginning, it is actually transformed from the initial avoidance of math[10]. In this process, a student with mathematical anxiety denied his ability to learn mathematics. He was convinced that he couldn't understand and master this subject at all, so he only spent a little energy on the mathematics, and even chose to ignore this subject directly, which led to loss in his learning process. After that, when he is faced with more difficult math-related subjects again, he will have stronger resistance and avoid math learning again, eventually turning the slight math avoidance at the beginning into serious math anxiety[10]. However, serious math anxiety will have destructive and negative effects on people's psychology[11]. Therefore, in order to improve teenagers' mathematical anxiety and improve their mathematical level, a large number of studies have explored and determined some factors related to mathematical anxiety from a single aspect. For example, some studies have explored the relationship between individual gender difference[12-13], learning style and motivation and math anxiety[14-17], some have analyzed the influence of parent-child relationship[18-19], parenting style and family academic support from parents on math anxiety[20-24]. What is more, there are some other studies starting from the school aspect. These papers discuss the relationship between school climate and teachers' teaching strategies and math anxiety[25-27]. However, most of the current studies only analyze and explain one aspect of mathematical anxiety, and only a few studies can comprehensively and systematically review the whole mathematical anxiety model from various perspectives and aspects. Therefore ,this research will focus on mathematics anxiety among adolescents (defined as 10-19 years old), analyze and summarize the relevant influencing factors and intervention measures of math anxiety from the aspects of individual, family and school, in order to provide a theoretical reference for a comprehensive understanding of the overall structure of math anxiety, so as to improve the status quo of math anxiety among adolescents more effectively, so that adolescents can face mathematics with a positive attitude and learn it well at the same time.

2. Influencing Factors

2.1. Individual Influencing Factors

2.1.1. Gender differences

Currently, a large number of studies have explored gender differences in math anxiety in adolescences, and the results show that, generally speaking, math anxiety in females is significantly higher than that in males[28]. For example, a study of 751 Chinese middle and high school students (ages 12 to 18, including 450 young women) found that females were more likely than males to show math anxiety[12]. In addition, a study of 415 year 9 students from seven New Zealand secondary schools also showed that women had significantly higher levels of math anxiety than men[13]. As far as the reasons are concerned, the gender difference of teenagers' mathematical anxiety can be attributed to the following reasons, namely, self-concept, attitude and gender stereotype[29].To begin with, self-concept can be defined as the sum of everyone's perception of themselves, and this self-identity plays an important role in everyone's psychological function[30]. Women have a lower degree of math-related self-concept and a study found that there is a reciprocal relationship between self-concept and math anxiety[31-32], that is, lower self-concept

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leads to higher math anxiety[33].Secondly, women tend to have a more negative attitude toward math than men and there is a positive correlation between math anxiety and negative attitude[34-36]. The higher the negative level, the higher the math anxiety level. In addition, gender stereotypes are perceptions of certain characteristics of men and women[37]. It is a type of belief, combined with gender identity and gender ideology, which constitutes a kind of discrimination based on gender[38].Women were more negatively affected by gender stereotypes about math performance[39].When the stereotype is prominent, the female group of adolescents will feel a low sense of belonging in the activities and courses about mathematics[40-41], resulting in negative consequences and increasing the degree of mathematics anxiety. Taken all together, there is a significant difference in the degree of math anxiety between different genders, and the negative effect and influence of females are greater than that of males.

2.1.2. Learning style

Some studies have analyzed the correlation between math anxiety and adolescents' individual learning styles and found that there is a significant correlation between different individual learning styles and math anxiety[42]. Individual learning styles can be roughly divided into four types, respectively independent learning style, participatory learning style, avoidance learning style and cooperative learning style[38].First of all, independent learning style refers to the individual's preference for independent thinking, and participatory learning style refers to the individual's desire for participation and collaboration[43], both of which have a low negative correlation with math anxiety[42].Secondly, avoidance learning style means that students are not interested in the content and do not want to participate in it[43], and there is a low positive correlation between this learning style and math anxiety, that is, the higher the avoidance learning style, the higher the level of math anxiety[42].In addition, cooperative learning style refers to willingness to share ideas with others[43], and there is a significant negative correlation between cooperative learning style and math anxiety[42].Therefore, different learning styles of adolescents can cause different degrees of math anxiety.

2.1.3. Personal motivation

Most previous studies have found that adolescents' personal motivation has an important influence on math anxiety. Personal motivation is a part of the individual's own goals and beliefs, which determines the degree or level of individual participation in certain circumstances[44]. Individual motivation includes intrinsic motivation of mathematics, motivation of student 'state and motivation of mathematics learning. First of all, mathematical internal motivation refers to adolescents' interest in mathematical related activities and their satisfaction and enjoyment of activities[45]. Some studies have found that this motivation can negatively affect mathematics anxiety[46]. The reason is that the internal motivation of mathematics learning orientation and mathematics anxiety involve opposites: internal motivation is the challenging and difficult task of learning and mastering mathematics methods and strategies, but mathematics anxiety is related to learning new knowledge and the fear and threats to challenging tasks[47], so there will be a negative relationship between them. Secondly, student state motivation refers to students' attempt to acquire academic knowledge or skills by discovering the meaning of existing classroom activities[16].Some studies have found that this kind of moving opportunity has a negative impact on mathematical anxiety[48].The reason for this is that when students' level of motivation increases, the classroom atmosphere becomes more supportive[47], that is, the classroom communication atmosphere will be more positive. So the classroom will show more motivation to succeed, and then students' satisfaction with the course will increase, which will have a more positive impact on their own learning and a stronger

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perception of cognitive learning, and finally lead to a low level of math anxiety[49]. Finally, mathematics learning motivation refers to the willingness, need, desire and compulsion of students to participate in the learning process and achieve success in this process[17]. Some studies have found that this motivation can negatively affect math anxiety[50].The reason is that the components of motivation are value, expectation and effect, and the expectation component is mainly influenced by learning problem, self-efficacy and learning belief control[51]. When negative results occur, students' confidence in mathematics decreases and negative attitudes increase[52]. That is, self-efficacy decreases, the control of learning beliefs weakens[53], and learning problems also increase. As a result, the "expectation" component is weakened, the motivation of mathematics learning is reduced, and finally the level of mathematics anxiety of students is increased[49].In conclusion, adolescents' personal motivation can significantly affect math anxiety, and there is a negative correlation between them.

2.2. Family Influencing Factors

2.2.1. Parent-child relationship

Research shows that the parent-child relationship in the family is closely related to the level of mathematics anxiety of adolescents. That is, parent-child relationship can negatively affect the level of mathematics anxiety[54]. Parent-child relationship refers to the first intimate relationship experienced by an individual, which has an important influence on the future development of children and adolescents and their ability to adapt to the environment[19]. Parent-child relationship is divided into parent-child relationship and parent-child relationship. There is no significant correlation between parent-child relationship and mathematical anxiety level[19], but the parent-child relationship is significantly negatively correlated with mathematical anxiety level. One reason for this is that fathers are more dominant than mothers in influencing their children's academic or math performance[19], and fathers generally reported higher self-concepts and assessments of their own mathematical abilities, as well as more intrinsic value in the field of mathematics[55],and the positive development of the father-son relationship makes the children feel the importance of mathematics through the father's daily behavior and dialogue, thus reducing the level of mathematics anxiety[56].Another reason is that fathers tend to be more excited, surprised, stimulated and temporarily destabilize their children while encouraging them to take and face risks in a safe environment. This relationship is called the “father-child activation relationship”[57]. When a high-quality and positive parent-child activation relationship develops, the child is properly and fully activated. The father encourages the child to challenge himself, get out of the comfort zone, eliminate the fear in his heart, enhance his confidence in himself, and help the child to overcome the anxiety he faces, thus the child's math anxiety level is lower[58].In conclusion, positive parent-child dynamic relationship has a positive impact on children's math anxiety level, that is, there is a negative correlation between them.

2.2.2. Parenting style

Some scholars have analyzed and discussed the relationship between parents' rearing patterns and math anxiety, and found that the different parenting patterns of parents are closely related to math anxiety. Parenting style is defined as an attitude towards children that is conveyed to and combined with them to create an emotional atmosphere in which parents' actions and attitudes are revealed[59].There are three kinds of parenting styles: authoritarian parenting style, authoritative parenting style and tolerant parenting style[20-22].The first is the authoritarian parenting style, which is characterized by parents having more restrictions on their children and using more punishments rather than rewards in the process of communicating with their children[23]. At the

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same time, parents have a strict set of rules and regulations that children must obey absolutely[23]. This parenting style has a significant and direct negative effect on math anxiety[23]. The second is the authoritative parenting style, which shows that parents paying attention to control methods, follow logical restrictions, and pay more attention to rewards rather than punishments in the process of getting along with children[23]. Previous studies on the relationship between this parenting style and math anxiety have been inconsistent. Some studies believe that there is a significant and direct positive effect between the two, while others believe that there is a significant and indirect negative effect between the two[23]. The direct effect is that the high level of authoritative parenting leads to the high level of mathematical anxiety, while the indirect negative effect is that the higher the level of authoritative parenting, the higher the level of mathematical self-efficacy, which leads to a 35% lower level of mathematical anxiety[23]. Finally, there is the tolerant parenting style, which is characterized by fewer requirements and restrictions from parents for children, while setting a flexible range for children's behavior[23]. There was no significant but direct positive effect between the parenting style and math anxiety[23].Therefore, different parenting styles can cause different levels of math anxiety.

2.3. School Influencing Factors

2.3.1. School atmosphere

Research shows that there is a close correlation between school atmosphere and adolescents ' level of math anxiety. School atmosphere includes two aspects: classroom discipline atmosphere and classroom environment atmosphere[25-26].To begin with ,classroom discipline atmosphere is to create a classroom atmosphere that is conducive to the progress of learning[60],and it has a positive effect on the level of math anxiety[25].The reason is that when the classroom discipline atmosphere is too high, the discipline has reached a pure autocratic system, students will feel oppressed and uneasy, and their learning efficiency will decrease, resulting in a higher level of mathematics anxiety[25]. Secondly, the classroom environment atmosphere can be divided into challenging environment atmosphere and negative environment atmosphere[26].Challenging environment atmosphere means that with the improvement of students' personal ability, the difficulty of the tasks they face will gradually increase, and the process of solving problems will become more and more difficult[26]. There is a negative correlation between challenging environment atmosphere and the level of math anxiety. The reason is that when the challenging atmosphere in class becomes more intense, students have to face higher difficulty in math learning, thus they become more interested in math and have stronger belief in themselves[61-62], which ultimately leads to the decline of math anxiety level. On the other hand, the environment with negative influence means that teachers use ineffective classroom structure in the teaching process, and students' practical adjustment ability is decreased[63], which has a positive correlation with the level of mathematics anxiety. The reason is that when the classroom environment becomes more and more negative, students become more and more disinterested and bored in the study of mathematics, which leads to the loss of self-efficacy belief and finally leads to the increase in the level of mathematics anxiety[63]. To sum up, the relationship between school atmosphere and math anxiety is very significant and close, and different forms and degrees of school classroom atmosphere eventually cause different levels of math anxiety.

2.3.2. Teachers’teaching strategies

Some scholars have studied and analyzed the relationship between teachers' teaching strategies and math anxiety and found that teachers’ inappropriate teaching strategies will have a negative impact on adolescents ' math anxiety level. Teaching strategies are teaching ideas that guide the

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introduction and development of work, and are used to solve practical problems and improve the ability of learning and understanding and professional quality[64].Current teaching strategy defects can be roughly divided into three categories[27], and all of them have an impact on math anxiety. To begin with, current teaching strategies tend to cultivate students' memory of arithmetic facts, rules and procedures, which leads to the majority of students only staying on the surface of memory, without in-depth understanding of the essence[27].When students need to use mathematics knowledge to solve problems, they are unable to respond quickly and lose confidence in mathematics learning, which leads to an increase in the level of mathematics anxiety[27].The second defect is that traditional teaching strategies rely too much on direct teaching[27]. In this direct teaching process, the teacher is the transmitter of information, while the student is the receiver and absorber of knowledge, and is in a passive position[27].Teachers do not really stimulate and promote children's curiosity and initiative in learning, and at the same time, students do not really participate in the process of mathematics teaching, and they do not establish a real understanding relationship with mathematics, unable to master mathematics skills, so the level of mathematics anxiety increases[27]. The third is that the current teaching strategies ignore the informal knowledge of mathematics accumulated by students in daily life and fail to combine formal and informal guidance knowledge of mathematics together[27].The lack of informal instruction knowledge will have a negative effect on students' mathematical understanding, mathematical memory and application of school mathematics[65-68].In addition, if formal guidance and informal knowledge are not linked together, students' understanding and acceptance of mathematics and practical application ability will decline[69-70], then lead to their own lack of confidence in mathematics, and eventually improve the degree of mathematics anxiety. To sum up, incorrect teaching strategies will not be conducive to the development of adolescents, and will have a close impact on the math anxiety level of young students.

3. Interventions

3.1. Individual Intervention Measures

Currently, researchers have proposed some effective and feasible interventions for individual math anxiety, including cognitive behavioral therapy, focused breathing training and expressive writing.

For the first intervention, cognitive behavioral therapy (CBT)[71], this therapy is a therapy in which therapists help patients understand their cognitive errors and distortions[72], based on the idea that cognitive distortions cause depression and anxiety[73].Moreover, due to the emergence of negative and irrational thinking, the individual cognition of students with math anxiety has been distorted to some extent, and their own cognition has also been affected to a certain extent[74]. Therefore, cognitive behavioral therapy (CBT) intervenes in adolescents' math anxiety from three aspects: physiological, behavioral and cognitive[75-76]. (a) Under the guidance of therapists, participants reduce their physiological level of math anxiety through relaxation or breathing training (b)Therapists guide participants to identify their own anxiety symptoms, and participants need to learn how to analyze the symptoms objectively and carefully. At the same time, therapists should also teach participants more useful new methods, so that participants can deal with the problem more flexibly (c)When faced with certain events that may cause anxiety, participants need to learn to change their inherent thinking and look at and solve problems from different perspectives[71].In addition, the cognitive behavioral therapy also targets the individual's own belief system, shows and explains rational thinking to patients with math anxiety, and helps them acquire a higher sense of self-efficacy, so that patients can better deal with emergencies in life flexibly and quickly adapt to the new environment[71]. Thus, through the reconstruction of belief, patients can shorten the gap between the real and ideal self[71], themselves can obtain a more positive academic self-concept,

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and effectively reduce the level of math anxiety. At present, some studies have been done to interfere with mathematics anxiety by rebuilding mathematics cognition among teenagers, and the results show that the level of mathematics anxiety among teenagers has decreased significantly. The whole intervention process was based on the guidance algorithm[77], including 12 weeks of treatment, 90 minutes of group discussion meeting and 30 minutes of behavioral strategy consultation each time[71]. The specific treatment steps are as follows[71].(a)Participants were divided into groups and familiarized with and understood the whole process of cognitive behavioral therapy. (b)Guide participants to understand and classify cognitive distortions. (c)Participants were aware of the past history of math anxiety. (d)Let participants learn how to rely on positive thoughts to overcome negative thoughts. (e)Participants discussed the downward arrow technique and their beliefs with the therapist. (f)Therapists required participants to perform daily relaxation exercises. (g)Therapists define self-concept. (h)The therapist explains and explains the mathematical self-concept. (i)Teach participants skills on how to improve their mathematical self-concept. (j)To prevent recurrence of participants' math anxiety. (k)Participants analyzed and summarized the whole intervention process.

As for the second intervention, that is, concentrated breathing training[78-79], the research shows that by improving the attention level of teenagers, their math anxiety is obviously reduced. The specific training process is as follows: first, participants were instructed by a recording to assume and maintain the following postures: sitting upright and unbent, with hands flat on knees, shoulders relaxed and spread, head centered on the body, and feet on the floor. Then, when they were fully comfortable with the pose, the participants had to close their eyes, and if they were uncomfortable with the pose, they could look down or straight ahead without having to focus specifically on an object. After that, participants were instructed to adjust their breathing, focusing on the feeling of breathing gas in and out of the bodies and through the nose, or paying attention to their abdomens slowly expanding with each inhalation and slowly retreating with each exhalation. The whole training process for 15 minutes, this training through brief focused breathing exercises, effectively improves the control level of attention of adolescents, at the same time, in the case of themselves in a huge pressure, adjust the negative emotion and anxiety of its bad, enabling them to focus on the math task itself rather than math anxiety[78-79].

As for the third kind of intervention, that is, expressive writing[80], some studies have been done to intervene in math anxiety by changing the stress level of teenagers. The results show that the math anxiety level of teenagers has decreased significantly. The specific methods are as follows: expressive writing is a simple clinical diagnostic technique that advocates people to record the source of their anxiety and the most real thoughts in their hearts[81].In this approach, the participants in seven minutes, write down their own is going to perform mathematical problems and needs to be done and the feeling of the heart, then, in began to write a second problem with feeling, careful to dig their own the most real emotions and ideas, need to keep themselves in the process of writing is still an open mind, try your best to record your thoughts without reservation to ensure the validity and authenticity of writing[80].Through expressive writing, in the process of individual mathematics task, the possibility of their own attention being distracted and weakened due to the emergence of math-related worry and anxiety is greatly reduced[82]. Meanwhile, it also changes the individual's stress situation and promotes the effective and positive emotional understanding, thus reducing the degree of mathematics anxiety[83-87].In addition, expressive writing can indirectly intervene in mathematics anxiety by helping individuals stay away from their own sources of stress and anxiety, and reduce the level of mathematics anxiety[88-89].

To sum up, mathematics anxiety can be intervened from three aspects of adolescents' own cognitive beliefs, attention concentration level and stress level, and an appropriate level of

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mathematics anxiety can promote the healthy development of individuals' body and mind, and effectively promote the learning of mathematics related aspects.

3.2. Family Intervention Measures

Currently, researchers have proposed some practical interventions for math anxiety in the family aspect, including father-child relationship based math practice activities and parents providing more academic support to children.

For the first intervention, mathematical practice based on the father-child relationship[19], some studies have focused on the father-son relationship in the family to intervene in mathematics anxiety, and the results found that the symptoms of mathematics anxiety in the adolescent group have been significantly reduced. The specific measures are as follows. Since studies have shown that there is no significant correlation between mother-child relationship and math anxiety[19], more math activities, such as emotional connection activities[19], can be done with children based on the father-child relationship. During this activity, the father and children support each other and help each other. Father also needs to set aside enough time to accompany their child, develop and cultivate common interests with them, so as to strengthen the relationship between father and son, and the formation of good parent-child relationships can effectively intervene math anxiety and buffer its negative impact[19].

As for the second kind of intervention, in which parents give and provide more academic support to their children[24], some studies have conducted interventions on math anxiety by giving children sufficient math learning support, and the results found that the degree of math anxiety in the adolescent group has significantly decreased. The specific implementation methods are as follows. (a)Encourage and promote children's interest in mathematics and science. (b)Participate in the relevant family mathematics seminar, so that they are able to help children solve some math problems. (c)Take your child to a library or museum for informal educational and academic activities. (d)Take the initiative to find out about some scientific research projects that take place outside school hours, on weekends or during the summer, and encourage your child to participate in them[90-91]. Through these measures, the parents actively organize children to participate in the activities of some meaningful and interesting mathematics. At the same time, they also give their children full academic support, which can not only encourage children to explore the relationships involved in the activities proactively, analyze and solve the problems, and think about mathematics in a more positive view[8], but also can make children's mathematics learning internal motivation increased significantly[24]. The warmth and confidence brought by parental academic support had a beneficial effect on children's math anxiety, which ultimately led to a significant reduction in anxiety[92].

To sum up, in terms of family, parents should accompany their children to do math parent-child activities and actively give their children enough math support.This can not only make children more motivated in mathematics learning, but also significantly strengthen their achievements, and effectively intervene in mathematics anxiety and reduce their level.

3.3. School and Teacher Intervention Measures

At present, some researchers have tried to intervene in teenagers' math anxiety by changing their learning environment from the perspective of schools and teachers. The first is the school aspect, which includes the following measures. (a)Establish a new educational form of "flipped classroom[93]", which is a student-centered teaching mode. With the help of modern scientific and technological means, the things that need to be learned in the classroom are transferred to the extracurricular activities[94-96].Students need to use video lectures, online reading, slide

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presentation and other forms to conduct independent learning. Later, the time in class is used for communication and discussion among students[93]. In this process, students need to continue in-depth research to fully understand and master the relevant knowledge points. The form of "flipped classroom" learning provides students with more personalized guidance and makes them passionate about math learning[93,97]. At the same time, it also has a positive impact on students' math scores[98]. So as to enhance students' confidence in mathematics learning, and finally reduce the level of anxiety in mathematics. (b) Open courses related to math anxiety[99]. This course will let students realize their own fear and misunderstanding of mathematics, and help them overcome the difficulties and obstacles on the road of mathematics, effectively enhance the confidence of mathematics learning, so as to intervene in mathematics anxiety and reduce its degree[100-101]. (c)Undertake educational activities on overcoming gender stereotypes[102]. Such education activities such as training, after-class seminars and lectures, and telling the students as long as they are willing to devote enough time and effort, and actively to learn new skills in mathematics, can make their own mathematical ability receive a significant boost, and also highlight the performance of mathematics to students and there is no relationship between gender[103]. This measure not only effectively reduces the influence of gender difference on teenagers' mathematics anxiety, but also fully mobilizes their initiative in mathematics learning, makes them more involved in mathematics tasks and finally reducing their mathematics anxiety level[102].

Secondly, with regard to teachers, specific measures are as follows. (a)Use hands-on methods in mathematics teaching[99]. In mathematics classroom, by choosing appropriate and correct visual teaching AIDS to create a real mathematics learning situation for students, not only can the teaching process be effectively prevented from being out of touch with the real life, but also students' understanding of mathematics can be prevented from only staying in simple pen and paper exercises. Hands-on practice can help students understand what mathematics is and how mathematics works better, thus reducing their anxiety levels in mathematics[104-105]. (b) Different communication methods should be established for different types of students[99]. For example, when teachers in the face of some students with weak self-consciousness and sensitive self-awareness, they first need to tell the students to avoid stereotype threat, at the same time stress the importance of efforts more than talent[106], encourage them to don't upset, and express their confidence, through the communication right guide students to establish correct learning motivation, to weaken the mathematics anxiety[107]. (c)Adjust the difficulty of the questions according to students' different levels[108]. By studying the flexible change in the difficulty of mathematics problems to adapt to the actual situation of each student, we can ensure to a great extent that all the students have a relatively high success rate in mathematics learning[108], and the ideal success rate can give students a great confidence and positive emotions in learning mathematics, so as to intervene in mathematics anxiety and reduce their anxiety level[109-115].

To sum up, the school can change the traditional form, offer courses and activities related to math anxiety to intervene the math anxiety of young people. At the same time, teachers can influence students' math anxiety level by increasing the proportion of practical teaching, establishing different communication ways, and using flexible difficulty adjustment and other measures. The relevant intervention measures of school and teachers can make the external learning environment of adolescents change positively, so as to fully mobilize the initiative of students to learn, and effectively prevent the generation of mathematics anxiety.

4. Summary and Prospect

Mathematics anxiety is a kind of psychological state that often appears in teenagers' study and life. Serious mathematics anxiety has certain destructive influence on teenagers' future development. At the same time, it has a negative impact on the training of talents in the whole society. Therefore, it

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is necessary and urgent to effectively intervene and improve teenagers' math anxiety. This study made a detailed review and analysis of the literature related to math anxiety, and systematically reviewed the influencing factors and intervention measures of math anxiety from the aspects of individuals, families and schools. What is more, this study also provides sufficient theoretical references for better understanding and acquaintance of the overall structure of mathematics anxiety, and at the same time points out a clear direction for the future work of mathematics education, which effectively alleviates the situation of adolescents' mathematics anxiety. But so far, there is a gap between the research level of math anxiety in China and other countries[116], and the intervention measures corresponding to each aspect of influence are not perfect. For example, as far as family influence is concerned, parent-child relationship is only one dimension of parents' participation[19]. Therefore, future research should focus on and analyze other dimensions of parents' participation, such as warmth and sensitivity of parents' expression, guiding and encouraging children to build autonomy, and parents' active participation in children's learning process[117]. In addition, future studies should carefully explore the path and relationship between parental engagement and adolescents' math anxiety[19], so as to develop more accurate and effective family-aspect intervention measures. On the other hand, although other countries have sufficient reserves of relevant literature, so that we can use them for reference, there are significant differences in the overall educational concept, social and cultural environment and mode of thinking activities among countries. Therefore, in the future research process, how to study the mathematics anxiety of adolescents based on China's national conditions and cultural atmosphere is a very crucial step[118]. At the same time, researchers should pay more attention to the structural complexity of math anxiety, so as to avoid only staying at a single aspect[119]. Nowadays, the social environment is constantly changing, and people's emphasis on mathematics is gradually increasing. Therefore, we need to proceed from the actual situation, comprehensively consider various factors, and formulate the most effective interventions measures and treatment programs in view of the present situation of mathematical anxiety among teenagers, so as to fundamentally prevent the occurrence of mathematical anxiety and really promote the all-round and healthy development of teenagers.

References

[1] *Greenwood, M. R. C., & North, K. K. (1999). Science Through the Looking Glass: Winning the battles but losing the war?. Science, 286(5447), 2072-2078.*

[2] *Ashcraft, M. H. , & Moore, A. M. . (2009). Mathematics anxiety and the affective drop in performance. Journal of Psychoeducational Assessment, 27(3), 197-205.*

[3] *Orabuchi N , Yeh C J , Chung C H , et al. Math Anxiety and Problem-Solving Strategies for Early Middle School Math Performance: Pilot Study[J]. 2013.*

[4] *Lonergan, M. . (2006). The case for creativity in math education. horace, 23, 3.*

[5] *Mundia, L. . (2012). The assessment of math learning difficulties in a primary grade-4 child with high support needs: mixed methods approach. International Electronic Journal of Elementary Education, 4(2), 347-366.*

[6] *Mazzocco, M. M., Hanich, L. B., & Noeder, M. M. (2012). Primary school age students' spontaneous comments about math reveal emerging dispositions linked to later mathematics achievement. Child Development Research, 2012.*

[7] *Ramirez, G., Shaw, S. T., & Maloney, E. A. (2018). Math anxiety: Past research, promising interventions, and a new interpretation framework. Educational Psychologist, 53(3), 145-164.*

[8] *Adams, C. (2001). Overcoming Math Anxiety. Mathematical intelligencer, 23(1).*

[9] *Maloney, E. A., & Beilock, S. L. (2012). Math anxiety: Who has it, why it develops, and how to guard against it. Trends in cognitive sciences, 16(8), 404-406.*

[10] *Shore, K. (2005). Dr. Ken Shore's classroom problem solvermath anxiety. Retrieved April, 9, 2006.*

[11] *Wang, Z., Hart, S. A., Kovas, Y., Lukowski, S., Soden, B., Thompson, L. A., ... & Petrill, S. A. (2014). Who is afraid of math? Two sources of genetic variance for mathematical anxiety. Journal of child psychology and psychiatry, 55(9), 1056-1064.*

DOI: 10.54254/2753-7048/2/2022419

[12]Xie, F., Xin, Z., Chen, X., & Zhang, L. (2019). Gender difference of Chinese high school students' math anxiety: The effects of self-esteem, test anxiety and general anxiety. Sex Roles, 81(3), 235-244.
[13]Mann, L. C., & Walshaw, M. (2019). Mathematics anxiety in secondary school female students: issues, influences and implications. New Zealand Journal of Educational Studies, 54(1), 101-120.
[14]Esa, S., & Mohamed, N. A. (2017, May). A study of students' learning styles and mathematics anxiety amongst form four students in Kerian Perak. In AIP Conference Proceedings (Vol. 1847, No. 1, p. 030002). AIP Publishing LLC.
[15]Gottfried, A. E. (1990). Academic intrinsic motivation in young elementary school children. Journal of Educational psychology, 82(3), 525.
[16]Myers, S. A., Goodboy, A. K., & Members of COMM 600. (2014). College student learning, motivation, and satisfaction as a function of effective instructor communication behaviors. Southern Communication Journal, 79(1), 14-26.
[17]Elander, Keli. (1999). The impact of teaching strategies on intrinsic motivation. Elementary Secondary Education, 28.
[18]Liu, E. Z. F., & Lin, C. H. (2010). The survey study of mathematics motivated strategies for learning questionnaire (MMSLQ) for grade 10-12 Taiwanese students. TOJET: The Turkish Online Journal of Educational Technology, 9(2).
[19]Vukovic, R. K., Roberts, S. O., & Green Wright, L. (2013). From parental involvement to children's mathematical performance: The role of mathematics anxiety. Early Education & Development, 24(4), 446-467.
[20]Baumrind, D. (1966). Effects of authoritative parental control on child behavior. Child development, 887-907.
[21]Baumrind, D. (1971). Current patterns of parental authority. Developmental psychology, 4(1p2), 1.
[22]Baumrind, D. . (2019). Parental disciplinary patterns and social competence in children parental disciplinary patterns a n d social competence in children.
[23]Macmull, M. S., & Ashkenazi, S. (2019). Math anxiety: The relationship between parenting style and math self-efficacy. Frontiers in Psychology, 1721.
[24]Rubach, C., & Bonanati, S. (2021). The impact of parents' home‐and school‐based involvement on adolescents' intrinsic motivation and anxiety in math. Psychology in the Schools.
[25]Radišić, J., Videnović, M., & Baucal, A. (2015). Math anxiety—contributing school and individual level factors. European Journal of Psychology of Education, 30(1), 1-20.
[26]Fast, L. A., Lewis, J. L., Bryant, M. J., Bocian, K. A., Cardullo, R. A., Rettig, M., & Hammond, K. A. (2010). Does math self-efficacy mediate the effect of the perceived classroom environment on standardized math test performance?. Journal of educational psychology, 102(3), 729.
[27]Baroody, A. J. , & Hume, J. . (1991). Meaningful mathematics instruction: the case of fractions. Remedial & Special Education, 12(3), 54-68.
[28]Else-Quest, N. M., Hyde, J. S., & Linn, M. C. (2010). Cross-national patterns of gender differences in mathematics: a meta-analysis. Psychological bulletin, 136(1), 103.
[29]Wang, L. (2020). Mediation relationships among gender, spatial ability, math anxiety, and math achievement. Educational Psychology Review, 32(1), 1-15.
[30]Simons, J., Capio, C. M., Adriaenssens, P., Delbroek, H., & Vandenbussche, I. (2012). Self-concept and physical self-concept in psychiatric children and adolescents. Research in developmental disabilities, 33(3), 874-881.
[31]Hyde, J. S. , Fennema, E. , Ryan, M. , Frost, L. A. , & Hopp, C. . (2006). Gender comparisons of mathematics attitudes and affect: a meta-analysis. Psychology of Women Quarterly, 14(3), 299-324.
[32]Goetz, T. , Frenzel, A. C. , Hall, N. C. , & Pekrun, R. . (2008). Antecedents of academic emotions: testing the internal/external frame of reference model for academic enjoyment. Contemporary Educational Psychology, 33(1), 9-33.
[33]Ahmed, W., Minnaert, A., Kuyper, H., & Van der Werf, G. (2012). Reciprocal relationships between math self-concept and math anxiety. Learning and individual differences, 22(3), 385-389.
[34]Watt, H. M. (2004). Development of adolescents' self‐perceptions, values, and task perceptions according to gender and domain in 7th‐through 11th‐grade Australian students. Child development, 75(5), 1556-1574.
[35]Nagy, G., Garrett, J., Trautwein, U., Cortina, K. S., Baumert, J., & Eccles, J. S. (2008). Gendered high school course selection as a precursor of gendered careers: The mediating role of self-concept and intrinsic value.
[36]Akin A, Kurbanoglu I N. The relationships between math anxiety, math attitudes, and self-efficacy: A structural equation model[J]. Studia Psychologica, 2011, 53(3): 263.
[37]Rosario Castillo-Mayén, & Montes-Berges, B. . (2014). Analysis of current gender stereotypes. Anales De Psicología, 30(3), 1044-1060.
[38]A Adán. (1998). Nelson, R.J. Psicoendocrinología. Las bases hormonales de la conducta. Barcelona, Ariel Psicología, 1996, 706 p.

DOI: 10.54254/2753-7048/2/2022419

[39]Steffens, M. C., Jelenec, P., & Noack, P. (2010). On the leaky math pipeline: Comparing implicit math-gender stereotypes and math withdrawal in female and male children and adolescents. Journal of Educational Psychology, 102(4), 947.
[40]Master, A., Cheryan, S., & Meltzoff, A. N. (2016). Computing whether she belongs: Stereotypes undermine girls' interest and sense of belonging in computer science. Journal of educational psychology, 108(3), 424.
[41]Master, A., Meltzoff, A. N., & Cheryan, S. (2021). Gender stereotypes about interests start early and cause gender disparities in computer science and engineering. Proceedings of the National Academy of Sciences, 118(48).
[42]Esa, S., & Mohamed, N. A. (2017, May). A study of students' learning styles and mathematics anxiety amongst form four students in Kerian Perak. In AIP Conference Proceedings (Vol. 1847, No. 1, p. 030002). AIP Publishing LLC.
[43]Cohen, A. D. , Oxford, R. L. , & Chi, J. C. . (2001). Learning style survey. Learning & Teaching in Practice/knowing the Learner/learning Preferences.
[44]Ames, C. (1992). Classrooms: Goals, structures, and student motivation. Journal of educational psychology, 84(3), 261.
[45]Deci, E. L., & Ryan, R. M. (2008). Facilitating optimal motivation and psychological well-being across life's domains. Canadian psychology/Psychologie canadienne, 49(1), 14.
[46]Gottfried, A. E. (1990). Academic intrinsic motivation in young elementary school children. Journal of Educational psychology, 82(3), 525.
[47]Gottfried, A. E. (1982). Relationships between academic intrinsic motivation and anxiety in children and young adolescents. Journal of School Psychology, 20(3), 205-215.
[48]Lin, Y., Durbin, J. M., & Rancer, A. S. (2017). Perceived instructor argumentativeness, verbal aggressiveness, and classroom communication climate in relation to student state motivation and math anxiety. Communication Education, 66(3), 330-349.
[49]Myers, S. A., Goodboy, A. K., & Members of COMM 600. (2014). College student learning, motivation, and satisfaction as a function of effective instructor communication behaviors. Southern Communication Journal, 79(1), 14-26.
[50]N Süren, & Kandemir, M. A. . (2020). The effects of mathematics anxiety and motivation on students' mathematics achievement. International Journal of Education in Mathematics Science and Technology, 8(3), 190.
[51]Aktan, S. , & Tezci, E. . (2013). The study of validity and reliabİlİty of self regulated learnİng strategies scale in mathematİcs. Nwsa Education ences.
[52]Simpkins, S. D., Davis-Kean, P. E., & Eccles, J. S. (2006). Math and science motivation: A longitudinal examination of the links between choices and beliefs. Developmental psychology, 42(1), 70.
[53]Liu, E. Z. F., & Lin, C. H. (2010). The survey study of mathematics motivated strategies for learning questionnaire (MMSLQ) for grade 10-12 Taiwanese students. TOJET: The Turkish Online Journal of Educational Technology, 9(2).
[54]Vukovic, R. K., Roberts, S. O., & Green Wright, L. (2013). From parental involvement to children's mathematical performance: The role of mathematics anxiety. Early Education & Development, 24(4), 446-467.
[55]Finnigan, K. M., & Corker, K. S. (2016). Do performance avoidance goals moderate the effect of different types of stereotype threat on women's math performance?. Journal of Research in Personality, 63, 36-43.
[56]Pekrun, R., & Perry, R. P. (2014). Control-value theory of achievement emotions. International handbook of emotions in education, 1, 120-141.
[57]Paquette, D. (2004). Theorizing the father-child relationship: Mechanisms and developmental outcomes. Human development, 47(4), 193-219.
[58]Bögels, S., & Phares, V. (2008). Fathers' role in the etiology, prevention and treatment of child anxiety: A review and new model. Clinical psychology review, 28(4), 539-558.
[59]Darling, N., & Steinberg, L. (2017). Parenting style as context: an integrative model. Interpersonal Development.
[60]OECD. Mathematics teaching and learning strategies in PISA.
[61]Zahorik, J. A. (1996). Elementary and secondary teachers' reports of how they make learning interesting. The Elementary School Journal, 96(5), 551-564.
[62]Meyer, D. K., Turner, J. C., & Spencer, C. A. (1997). Challenge in a mathematics classroom: Students' motivation and strategies in project-based learning. The Elementary School Journal, 97(5), 501-521.
[63]Usher, E. L. (2009). Sources of middle school students' self-efficacy in mathematics: A qualitative investigation. American Educational Research Journal, 46(1), 275-314.
[64]Jun-Hong, D. O. N. G. (2016). Teaching Strategy of Medical Biochemistry. DEStech Transactions on Social Science, Education and Human Science, (icaem).
[65]Baroody, A. J. (1987). Children's mathematical thinking: A developmental framework for preschool, primary, and special education teachers. Teachers College Press.
[66]Fuson, K. C. . (1988). Children's counting and concepts of number.

DOI: 10.54254/2753-7048/2/2022419

[67]Ginsburg, H. . (1989). Children's arithmetic : how they learn it and how you teach it. PRO-ED.
[68]Hughes, M. (1986). Children and number: Difficulties in learning mathematics. Wiley-Blackwell.
[69]Fuson, K. C., & Briars, D. J. (1990). Using a base-ten blocks learning/teaching approach for first-and second-grade place-value and multidigit addition and subtraction. Journal for research in mathematics education, 21(3), 180-206.
[70]Hiebert, J., & Wearne, D. (1988). Instruction and cognitive change in mathematics. Educational Psychologist, 23(2), 105-117.
[71]Asanjarani, F., & Zarebahramabadi, M. (2021). Evaluating the effectiveness of cognitive-behavioral therapy on math self-concept and math anxiety of elementary school students. Preventing School Failure: Alternative Education for Children and Youth, 65(3), 223-229.
[72]Longmore, R. J., & Worrell, M. (2007). Do we need to challenge thoughts in cognitive behavior therapy?. Clinical psychology review, 27(2), 173-187.
[73]Davis, R. A. . (2001). A cognitive-behavioral model of pathological internet use. Computers in Human Behavior, 17(2), 187-195.
[74]Joseph, M., Furner, Barbara, T., & Berman. (2003). Review of research: math anxiety: overcoming a major obstacle to the improvement of student math performance. Childhood Education.
[75]Arslan, G., Asanjarani, F., Bakhtiari, S., & Hajkhodadadi, F. (2020). School belonging in adolescents: Psychometric properties of the School Belongingness Scale in Iranian students. Journal of Psychologists and Counsellors in Schools, 1-10.
[76]Arslan, G., Asanjarani, F., Bakhtiari, S., & Hajkhodadadi, F. (2020). School belonging in adolescents: Psychometric properties of the School Belongingness Scale in Iranian students. Journal of Psychologists and Counsellors in Schools, 1-10.
[77]Chorpita, B. F., Taylor, A. A., Francis, S. E., Moffitt, C., & Austin, A. A. (2004). Efficacy of modular cognitive behavior therapy for childhood anxiety disorders. Behavior Therapy, 35(2), 263-287.
[78]Arch, J. J., & Craske, M. G. (2006). Mechanisms of mindfulness: Emotion regulation following a focused breathing induction. Behaviour research and therapy, 44(12), 1849-1858.
[79]Kabat-Zinn, J. (2005). Guided Mindfulness Meditation (Guided Mindfulness)[UNABRIDGED](Audio CD).
[80]Park, D., Ramirez, G., & Beilock, S. L. (2014). The role of expressive writing in math anxiety. Journal of Experimental Psychology: Applied, 20(2), 103.
[81]Pennebaker, J. W., & Beall, S. K. (1986). Confronting a traumatic event: toward an understanding of inhibition and disease. Journal of abnormal psychology, 95(3), 274.
[82]Lepore, S. J., Greenberg, M. A., Bruno, M., & Smyth, J. M. (2002). Expressive writing and health: Self-regulation of emotion-related experience, physiology, and behavior.
[83]Boals, A. (2012). The use of meaning making in expressive writing: When meaning is beneficial. Journal of Social and Clinical Psychology, 31(4), 393-409.
[84]Gray, J. R., Braver, T. S., & Raichle, M. E. (2002). Integration of emotion and cognition in the lateral prefrontal cortex. Proceedings of the National Academy of Sciences, 99(6), 4115-4120.
[85]Moser, J. S., Most, S. B., & Simons, R. F. (2010). Increasing negative emotions by reappraisal enhances subsequent cognitive control: a combined behavioral and electrophysiological study. Cognitive, affective, & behavioral neuroscience, 10(2), 195-207.
[86]Ochsner, K. N., & Gross, J. J. (2005). The cognitive control of emotion. Trends in cognitive sciences, 9(5), 242-249
[87]Ochsner, K. N., & Gross, J. J. (2008). Cognitive emotion regulation: Insights from social cognitive and affective neuroscience. Current directions in psychological science, 17(2), 153-158.
[88]Kross, E., & Ayduk, O. (2011). Making meaning out of negative experiences by self-distancing. Current directions in psychological science, 20(3), 187-191.
[89]Ochsner, K. N., & Gross, J. J. (2008). Cognitive emotion regulation: Insights from social cognitive and affective neuroscience. Current directions in psychological science, 17(2), 153-158.
[90]Kober, N. . (1991). What we know about mathematics teaching and learning. edtalk. attitudes.
[91]López del Bosque, R. (2000). Parent leaders in schools. Intercultural Development Research Association.
[92]McLeod, B. D., Wood, J. J., & Weisz, J. R. (2007). Examining the association between parenting and childhood anxiety: A meta-analysis. Clinical psychology review, 27(2), 155-172.
[93]Maldonado, A. D., & Morales, M. (2019). Modelling dependency structures produced by the introduction of a flipped classroom. Mathematics, 8(1), 19.
[94]Bergmann, J., & Sams, A. (2012). Flip your classroom: Reach every student in every class every day. International society for technology in education.
[95]Network, F. L. (2014). Definition of Flipped Learning-Flipped Learning Network Hub.
[96]Hamdan, N., McKnight, P., McKnight, K., & Arfstrom, K. M. (2013). A review of flipped learning. Flipped Learning Network. George Mason University: Harper and Row Ltd.

DOI: 10.54254/2753-7048/2/2022419

[97]O'Flaherty, J., & Phillips, C. (2015). The use of flipped classrooms in higher education: A scoping review. The internet and higher education, 25, 85-95.

[98]McBride, C. (2015). Flipping advice for beginners: What I learned flipping undergraduate mathematics and statistics classes. Primus, 25(8), 694-712.

[99]Iossi, L. (2013). Strategies for reducing math anxiety in post-secondary students.

[100] American River College. (2006). Fall 2006 class schedule: Mathematics. Retrieved September 16, 2006, from http://www.losrios.edu/arc/fall/Mathematics-MATH.html

[101] Butte College. (2006). Math catalog. Retrieved September 16, 2006, from http://www.butte.edu/information/catalog/course_descriptions/catalog_math.html

[102] Rahe, M., & Quaiser-Pohl, C. (2021). Can (perceived) mental-rotation performance mediate gender differences in math anxiety in adolescents and young adults?. Mathematics Education Research Journal, 1-25.

[103] Lee, J., Lee, H. J., Song, J., & Bong, M. (2021). Enhancing children's math motivation with a joint intervention on mindset and gender stereotypes. Learning and Instruction, 73, 101416.

[104] Harper, N. W., & Daane, C. J. (1998). Causes and reduction of math anxiety in preservice elementary teachers. Action in Teacher Education, 19(4), 29-38.

[105] Vinson, B. M. (2001). A comparison of preservice teachers' mathematics anxiety before and after a methods class emphasizing manipulatives. Early Childhood Education Journal, 29(2), 89-94.

[106] Osborne, J. W. (2001). Testing stereotype threat: Does anxiety explain race and sex differences in achievement?. Contemporary educational psychology, 26(3), 291-310.

[107] Beilock, S. L., & Willingham, D. T. (2014). Math Anxiety: Can Teachers Help Students Reduce It? Ask the Cognitive Scientist. American educator, 38(2), 28.

[108] Jansen, B. R., Louwerse, J., Straatemeier, M., Van der Ven, S. H., Klinkenberg, S., & Van der Maas, H. L. (2013). The influence of experiencing success in math on math anxiety, perceived math competence, and math performance. Learning and Individual Differences, 24, 190-197.

[109] Bekdemir, M. (2010). The pre-service teachers' mathematics anxiety related to depth of negative experiences in mathematics classroom while they were students. Educational studies in mathematics, 75(3), 311-328.

[110] Chinn, S. (2009). Mathematics anxiety in secondary students in England. Dyslexia, 15(1), 61-68.

[111] Chiu, L. H., & Henry, L. L. (1990). Development and validation of the Mathematics Anxiety Scale for Children. Measurement and evaluation in counseling and development.

[112] Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. Journal for research in mathematics education, 21(1), 33-46.

[113] Ho, H. Z., Senturk, D., Lam, A. G., Zimmer, J. M., Hong, S., Okamoto, Y., ... & Wang, C. P. (2000). The affective and cognitive dimensions of math anxiety: A cross-national study. Journal for research in Mathematics Education, 31(3), 362-379.

[114] Ma, X. (1999). A meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics. Journal for research in mathematics education, 30(5), 520-540.

[115] Rubinsten, O., & Tannock, R. (2010). Mathematics anxiety in children with developmental dyscalculia. Behavioral and Brain functions, 6(1), 1-13.

[116] Wu yaokun, Tang Qiang, & Feng Renyong. (2014). An Overview of mathematics anxiety research. Science and Education Literature Exchange, 000(013), 191-191,222.

[117] Edwards, C. P., & Knoche, L. (2010). Parent-Child Relationships in Early Learning.

[118] Foley, A. E., Herts, J. B., Borgonovi, F., Guerriero, S., Levine, S. C., & Beilock, S. L. (2017). The math anxiety-performance link: A global phenomenon. Current Directions in Psychological Science, 26(1), 52-58.

[119] Sorvo, R., Koponen, T., Viholainen, H., Aro, T., Räikkönen, E., Peura, P., ... & Aro, M. (2019). Development of math anxiety and its longitudinal relationships with arithmetic achievement among primary school children. Learning and Individual Differences, 69, 173-181.