Educational Administration: Theory and Practice
2023, 29(4), 2307 - 2313
ISSN: 2148-2403
https://kuey.net/

Research Article

Exploring The Effect Of Personality Traits On Mathematics Anxiety Among School Going Adolescents

Sukanta Koner[1], Dr. Liton Mallick[2*], Prof. (Dr.) Mita Banerjee[3]

[1]Research Scholar, Department of Education, Swami Vivekananda University, Barrackpore, West Bengal, India
[2*]Assistant Professor & HOD, Department of Education, Swami Vivekananda University, Barrackpore, West Bengal, India
[3]Professor, Department of Education, Swami Vivekananda University, Barrackpore, West Bengal, India

***Corresponding Author:** Dr. Liton Mallick
*Email: litonm@svu.ac.in

Citation: Dr. Liton Mallick, et.al (2023) Exploring The Effect Of Personality Traits On Mathematics Anxiety Among School Going Adolescents, *Educational Administration: Theory and Practice*, 29*(4)* 2307 - 2313
Doi: 10.53555/kuey.v29i4.7082

ARTICLE INFO

ABSTRACT

Of the diverse concerns that have been given much attention by scholars and educators in Mathematics education, stress arising from the area of Mathematics has emerged as a significant one. It impacts learners, sometimes determining how this they will approach the particular subject in the future. This study will therefore seek to establish relationships between personality characteristics and Mathematics stress found amongst students. This participate into further elucidation of the effects of such personality dimensions as 'Big Five' personality model dimensions which includes "Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism" of the participants on the experienced Mathematics-related stress intensity. The type of research of this study was quantitative which came under ex-post-facto research design. To test the proposed hypothesis, Standardized instruments namely "Mathematics Anxiety Rating Scale (MAS), and Big Five Inventory (BFI)" were used and data was collected on 246 respondents through a stratified random sampling technique from different grades 9 to 11 of various D.A. getting Anglo-Indian & private English medium schools. Mathematics anxiety has vast impacts on students and their academic performance; through the use of T-scores and multiple regression analysis, the study seeks to give more light on the relationship between these variables and afford better ways of dealing with this challenge even though, to educators and psychologist.

Keywords: Mathematics Anxiety, Personality factors, School going adolescents.

Introduction

First of all, it must be mentioned that Mathematics is an incredible tool and is used in an innumerable number of contexts. Due to its capacity to enhance the extent of attentiveness, logical as well as analytical ability, it might have the possibility to improve mental progress. We could also, for example, have the list of those using Mathematics in their workplace such as chefs, farmers, carpenters, mechanics, store owners, physicians, musicians and so on. As a result, one may claim that a minimal level of numeracy is quite reasonable for everyone **(Shishigu, 2018).** Mathematics then is kind of central to our understanding of the world around us and hence fundamental to human cogitation and reasoning. When it comes to STEM disciplines – and the social and medical sciences, the physical sciences and more – **Smith (2004)** asserts that the support for Mathematics as a robust subject is concrete. As already indicated, it is crucial for every country to improve the performance and overall competency of the learners in Mathematics **(Hoyles et al., 2015).**

As for the second level, the emphasis should be made on Mathematics which assists the students to get degree in the subject, enter the desired institution, become employed in the future profession, and receive more money. Mathematics is undoubtedly a core subject regarded as highly significant in the primary, secondary and university levels **(Mujtaba et al., 2014).** Mathematics is considered to be a challenging subject, thus, students get stressed regarding their performance and have negative outcomes on their performances as

documented by **Yenilmez et al., (2007)**. As **Hill et al. (2016)** revealed, mathematics anxiety refers to hopeless and helpless feelings in regards to Mathematics which makes it easy for a student to feel incapable of solving problems in Mathematics. Starting from elementary level to university level, students throughout the globe feel Mathematics anxiety at every stages of education **(Mahmood, 2010).**

Major concern of teachers is that concerning stress observed among students in Mathematics; they have an opinion that it is indicative of its impact in that instance where a student does not wish to deal with it again **(Anderson, 2015).** Hence, when faced with hurdles requiring the use of Mathematics, for instance, tasks or activities, an individual probably would experience nervousness or discomfort dubbed the Mathematics anxiety. At present, Mathematics anxiety can be considered normal since most people, especially students, have had experiences with this condition that is challenging for educators who seek to build an optimal environment that will help learners feel at ease and achieve in school, not to mention fostering their psychological well-being. These are not just some random effects and leaving Mathematics anxiety out of the picture can be incredibly disadvantageous to the growth of a student and their academic success and attitude towards Mathematics in general.

Mathematics anxiety pertains to those feelings that lead to undesirable emotion in Mathematics and affects cognitive effectiveness, decision-making capacity and Mathematics performance emerging from self-esteem **(Ruff & Boes, 2014).** Whereas, self-esteem portrays a crucial characteristic partially defining pupils' capacities and self-value, it characterizes their Mathematics competency that may signify a crucial indicator of how Mathematics Anxiety unveils.

Neuroticism is positively connected with test anxiety, and it is modestly and positively correlated with extraversion and test anxiety, according to a report on a investigation done by **Chamorro-Premuzic et al. (2008)**. On the other hand, it was claimed that the core self-evaluation of the person did not accurately predict the test-anxiety characteristic of that person when these two dimensions of personality were considered. This is especially important since it shows that personality traits—namely, neuroticism and extraversion—may be a more useful tool for diagnosing test anxiety than the CSES.

Objectives:

1. to compare personality factors and Mathematics anxiety of the Boys and Girls school-going adolescents;
2. to construct a "multiple regression equation" to predict Mathematics anxiety based on different dimensions of personality factors of the school-going Boys adolescents;
3. to construct a "multiple regression" equation to predict Mathematics anxiety based on different dimensions of personality factors of the school-going Girls adolescents;

Hypotheses:

i) There is no difference between Male and female school going adolescents in Mathematics anxiety.
ii) There is no difference between Male and Female school-going adolescents with respect to their personality factors.
iii) There remain statistically significant multiple regression coefficients to form the multiple regression equation to predict mathematics anxiety with the help of different facets of personality factors of male school-going adolescents.
iv) There remain statistically significant multiple regression coefficients to form the multiple regression equation to predict mathematics anxiety with the help of different facets personality factors of female school-going adolescents.

Literature Review:

According to **Ruff and Boes (2014),** mathematics anxiety is a subtype of mathematics phobia, which is characterized by negative feelings about mathematics that affect one's capacity for thought, judgment, and academic achievement. Additionally, compared to younger children, older students showed less anxiety related to mathematics, according to research. **Monge, Gonzalez, and Castro (2017)** sought to ascertain the association between mathematics anxiety and pertinent factors such gender, academic standing, prior math credits, and type of school. On a 5-point rating system, 472 pupils assigned a medium level of anxiety to math. Additionally, the findings demonstrated that math anxiety was higher in female students and much lower in graduates of private schools than in students of conventional public schools. Compared to male students, female students experienced more arithmetic anxiety. Furthermore, there was a negative association discovered between students' anxiety levels and their accomplishment in mathematics, with worse academic achievement among those with higher anxiety levels. Most personality psychologists generally agree that there are five main domains for classifying personality traits: emotionality, assertiveness, sensitivity, impulsivity, and bitterness **(Costa, McCrea, 1992).** The following five personality qualities are referred to as "OCEAN," a commonly used abbreviation for the five primary domains of personality in psychology, sometimes known as "the Big Five." Neuroticism determines whether a person is stable or not, and it comprises qualities like guilt, anger outbursts and anxiety among others. A high extent of relationship between this domain and certain psychiatric problems exists. One leading aspect of extraversion is that it defines a person's energy level, mood variation and talkativeness. Very simply, being open to new experiences

indicates one's beliefs, emotions and attitude. Agreeableness can be defined mainly as a personality trait referring to a specific set of inter-personal skills a person may have. One aspect of conscientiousness is about responsible behavior of a person, self-discipline. There are five elements and five traits that go together to describe various aspects of human behavior. Earlier research has established connections between these categories and both general anxiety as well as test-anxiety. According to **Barlow & Craske (2007), Gray (1982** cited in **Barlow & Craske, 2007**) states in his research that neuroticism is a personality trait closely linked with anxiety disorders. Furthermore, neuroticism is considered by some researchers as an anxiety disorder-specific factor. Notably, anxiety and neuroticism were once used interchangeably, and up until the 1980s, anxiety disorders were referred to as neurotic disorders **(Clark, Watson, & Mineka, 1994)**. Although the 'tripartite model' by **Clark and Watson (1991**) offers a preliminary foundation to the prediction that neuroticism could be correlated with Mathematics anxiety, there does not appear to be any empirical evidence at this time suggesting that personality traits may affect Mathematics anxiety. They propose that anxiety and depression have one factor labeled negative effect, a temperamental facet involved in the personality dimension of neuroticism. It is significant to remember that, in addition to the previously mentioned elevated negative effects, positive affect and "autonomic hyper-arousal," two additional temperamental dimensions, can also be used to distinguish between the symptoms of anxiety and depression. In greater details, **Clark and Watson**, advanced that one distinctive characteristic of depression is low positive affectivity, which is also a glib way of saying extraversion, and high "autonomic hyper-arousal." can be said to be unique to anxiety only; this means that while doing a particular activity, particularly using Mathematics, research has indicated that Mathematics anxious people show high "autonomic hyper-arousal" Consequently, it appears highly likely that negative affect could be linked to anxiety related to mathematics; perhaps this also holds true for neuroticism. 'Neuroticism' may be linked to mathematics anxiety as even research on personality traits and 'test anxiety' confirms this relationship. A 2008 study by **Chamorro-Premuzic et al.** found that extraversion is very weakly connected with test anxiety, but neuroticism is strongly correlated with an individual's likelihood of experiencing test anxiety. When comparing these two facets of personality to the core evaluations of the subjects, these evaluations were unable to explain the subjects' propensity for test anxiety. It's important because it suggests that traits like neuroticism and extraversion are more reliable indicators of test anxiety than a person's core self-perception. Although they contain cognitive and emotional components, respectively, **Dew (1984), Hembree (1990), and Chamorro-Premuzic et al. (2008)** have found a link between mathematics anxiety and test anxiety, implying that the two are more or less the same thing. A young person's adolescent experience is heavily influenced by their cultural background. Adolescent age has a favorable correlation with conscientiousness, agreeableness, and openness to new experiences **(Bojjagani & Bilquis, 2022).**

Research gap: Mathematics-related disciplines are dreaded by most students due to a widely studied concept called "Mathematics anxiety" which is known for its negative effects on performance and motivation. Previous empirical studies have found that Mathematics anxiety has multiple causes, such as personal factors, affective factors and cognitive factors. As a result, contemporary researchers have been studying the role played by personality variables in the development and manifestation of this condition. This research aims to bridge this gap through examination of the link between Mathematics anxiety of high school students and their Big Five personality traits.

Methodology:

Variables: Personality Factors was the independent variable and Mathematics anxiety was the dependent variable of the present study.

Participants:

Information regarding the variables incorporated in the research was achieved by the administration of the following standardized instruments on the selected sample. The chosen sample of subjects was given standardized instruments in order to gather data about the variables taken into account in this investigation. The researcher decided to adopt stratified random sampling technique in coming up with the research sample. This was collected from adolescent student populations at D.A. getting Anglo Indian as well as private English medium schools located within West Bengal. There were 246 high school individuals who formed the study sample and were drawn from six D.A. getting Anglo Indian and Private English medium schools. These were students placed between grade nine and eleven years who were of equal number in terms of gender.

Instruments: Those who volunteered for the study were given standardized questionnaires to provide data on the areas of the current research. The five personality qualities were evaluated using the "Big Five Inventory (BFI)" **(Goldberg, 1992**), while the mathematics anxiety was measured using the Mathematics Anxiety Scale (MAS) (**Zakariya, 2018**). These are instruments that are currently norm-referenced and have acceptable reliability and validity.

Procedure for gathering data: At an agreed institution level from the head of institution then consent given by parents of children involved; the pupils had to fill in questionnaire forms that were provided in all two assessment tools within school premises as they were monitored by either their teacher or a researcher.

Data Analysis: Employing T-scores and multivariate regression analysis, the information obtained was investigated for connection between variables using descriptive and regression analysis performed with SPSS software.

Personality factors and mathematics anxiety	*Gender*	*Mean*	*Standard deviation*	*t-score*	*p- score*
Neuroticism	Boys	3.45	0.54	-1.4125	0.159
	Girls	3.55	0.57		
Extraversion	Boys	3.85	0.58	2.0992	0.036
	Girls	3.70	0.54		
Openness	Boys	3.65	0.55	1.3503	0.178
	Girls	3.55	0.61		
Agreeableness	Boys	3.50	0.63	-2.5903	0.010
	Girls	3.70	0.58		
Conscientiousness	Boys	3.70	0.52	2.1561	0.032
	Girls	3.55	0.57		
Math Anxiety	Boys	2.95	0.70	-3.4337	0.007
	Girls	3.25	0.67		

The two-tailed P value equals 0.1591 for t = 1.4125, df = 244.
The difference between mean of boys and girls in neuroticism is not significant in 95% interval.
Adolescent boys and girls neuroticism is not significantly different from one another.
The two-tailed P value equals 0.036 for t = 2.0992, df = 244.
The difference between mean of boys and girls in Extraversions is significant in 95% interval.
There is a significant difference in Extraversions between boys and girls adolescent students. Boys' have significantly higher levels of Extraversions compared to girls.
A two-tailed P value of 0.178 is obtained for t = 1.3503 and df = 244.
In the 95% interval, the mean There is no significant difference in Openness scores of males and females. Adolescent boys and girls students' Openness does not significantly differ from one another.

A two-tailed P value of 0.010 is obtained for t = -2.5903 and df = 244. In a 95% confidence interval, the mean Agreeableness difference between boys and girls is extremely significant. Adolescent boys and girls students' levels of agreeableness varied significantly. When it comes to agreeableness, girls score much higher than boys.

For t = 2.1561, df = 244, the two-tailed P value is equal to 0.032. In a 95% confidence interval, there is a significant difference in the mean conscientiousness between boys and girls. The level of conscientiousness varies significantly between boys and girls.

Multiple Regression analysis:

Predictor	**B '(Regression Coefficient')**	**SE ('Standard Error')**	**β ('Standardized Coefficient')**	**'t-value'**	**'p-Value'**
Intercept	**5.23**	**0.45**	**-**	**11.62**	**<0.001**
Openness	-0.72	0.18	-0.25	-3.98	<0.001
Conscientiousness	-0.55	0.21	-0.18	-2.61	0.011
Extraversion	0.39	0.15	0.14	2.60	0.012
Agreeableness	-0.28	0.17	-0.10	-1.63	0.106
Neuroticism	1.05	0.20	0.37	5.25	<0.001

Openness: The higher the degree of openness, the less math anxiety there is ($\beta = -0.25$, $p < 0.001$).

Conscientiousness: It has also been revealed that greater levels of conscientiousness lead to lesser math anxiety though less effectively (β = -0.18, p = 0.011).

Extraversion: Conversely, individuals with high degree of extroversion experience slightly increased math anxiety symptoms (β = 0.14, p = 0.012).
Agreeableness shows a slight lowering trend in terms of math anxiety. But it is not statistically significant (β = -0.10, p = 0.106).
There is a srong correlation between neuroticism and increased math anxiety (β = 0.37, p < 0.001).

Mathematics Anxiety Girls = 5.23−0.72×Openness−0.55×Conscientiousness+0.39×Extraversion−0.28×Agreeableness+1.05×Neuroticism
When all the personality factors are zero then Mathematics anxiety for girls are 5.23 and sign of the coefficients signify the relationship is direct or inverse.
Model summary: R^2=0.52 implies 52% of sample among girls students regarding the effect of personality factor on mathematics anxiety can be determined.

For Boys Mathematics anxiety:
.

Predictor	**B ('Regression Coefficient')**	**SE ('Standard Error')**	**β ('Standardized Coefficient')**	**t-value**	**p-** value
Intercept	4.20	0.50	-	8.40	**<0.001**
Openness	-0.60	0.18	-0.21	-3.33	0.002
Conscientiousness	-0.40	0.22	-0.14	-1.82	0.076
Extraversion	0.30	0.16	0.17	1.88	0.067
Agreeableness	-0.25	0.20	-0.11	-1.25	0.215
Neuroticism	0.70	0.25	0.26	2.80	0.009

Openness, Conscientiousness, and Agreeableness appear negative coefficients, recommending that higher levels of these characteristics are related with lower mathematics anxiety, in spite of the fact that the impact isn't continuously factually noteworthy.

Extraversion and Neuroticism appear positive coefficients, showing that higher levels of
these characteristics are related with higher math uneasiness.
Neuroticism has a statistically significant positive effect on math anxiety (β = 0.26, p = 0.009).
When all the personality factors are zero then Mathematics anxiety for girls are 4.20 and sign of the coefficients signify the relationship is direct or inverse

Mathematics Anxiety Boys= 4.20−0.60×Openness−0.40×Conscientiousness+0.30×Extraversion−0.25×Agreeableness+0.70×Neuroticism
Model summary: R^2=0.45 implies 45% of sample among girls students regarding the effect of personality factor on mathematics anxiety can be determined.

Findings and Discussion:

Based on the aforementioned conclusion, it can be inferred that the purpose of this study was to ascertain if personality traits and mathematics anxiety are related among adolescents enrolled in school. Additionally, the researchers looked into the possibility that gender differences in personality factors could predict

mathematics anxiety. Students in mathematics (non-science track) classes were randomly selected, and the Big Five Inventory evaluating the 5-factor personality model and **MAS (Zakaria)** were administered to them in order to provide answers to these questions. The findings imply that girls are more anxious about math than boys are. There is no significant difference in neuroticism and openness between boys and girls adolescent students. Boys' have significantly higher levels of Extraversions and Conscientiousness compared to girls. Girls have significantly higher levels of Agreeableness compared to Boys.
For girls: Math anxiety is correlated with higher levels of conscientiousness and openness. There is a small correlation between slightly higher levels of extraversion and mathematics anxiety. There is a tendency for agreeableness to indicate less mathematics anxiety. There is a substantial correlation between increased neuroticism and increased mathematics anxiety.

For Boys: The association between lower levels of mathematics anxiety and openness, conscientiousness, and agreeableness is not always statistically significant, as evidenced by the negative coefficients. Higher openness and conscientiousness are connected with lower mathematics anxiety. Higher levels of extraversion are linked to somewhat higher levels of mathematics anxiety. Agreeableness indicates a trend toward less math anxiety. Higher degrees of neuroticism are significantly associated with increased math anxiety.
Personality factors can be the most important predictor of Mathematics anxiety.

Conclusion:

The findings of this study can throw light on the most important issues mathematics anxiety which is main barrier of taking mathematics and science in higher class. Teachers and specifically mathematics educators have to take course of action to reduce the mathematics anxiety through increasing the levels of the personality traits like Openness, Conscientiousness, and Agreeableness and to reduce neuroticism factors among adolescent students. Proper strategy is to be developed through study of each child's proper personality factors and it's effect on mathematics anxiety to excel in academic activities through overcoming this anxiety. Further research is required to examine the interaction of specific personality traits and math anxiety in order to design more targeted interventions and strategies to help students.

Reference:

1. Anderson-Mix, A. R. (2015). *THE IMPACT OF MATHANXIETY IN THE PRIMARY GRADES* (Doctoral dissertation, BEMIDJI STATE UNIVERSITY).
2. Bojjagani B, Bilquis LU. A study on Adolescents Personality factors. Indian Research Journal of Extension Education. 2022, 1-4.
3. Chamorro-Premuzic, T., Ahmetoglu, G., & Furnham, A. (2008). Little more than personality: Dispositional determinants of test anxiety (the Big Five, core self-evaluations, and self-assessed intelligence). *Learning and Individual Differences*, *18*(2), 258-263.
4. Clark, L. A., & Watson, D. (1991). Tripartite model of anxiety and depression: psychometric evidence and taxonomic implications. *Journal of abnormal psychology*, *100*(3), 316.
5. Clark, Lee & Watson, David & Mineka, Susan. (1994). Temperament, Personality, and the Mood and Anxiety Disorders. Journal of abnormal psychology. 103. 103-16. 10.1037/0021-843X.103.1.103.
6. Clark-Wilson, A., Hoyles, C., Noss, R.(2015). Scaling a technology-based innovation: windows on the evolution of mathematics teachers' practices. *ZDM Mathematics Education* **47**, 79–92 https://doi.org/10.1007/s11858-014-0635-6
7. Costa Jr, P. T., & McCrae, R. R. (1992). Four ways five factors are basic. *Personality and individual differences*, *13*(6), 653-665.
8. Craske, M. G., & Barlow, D. H. (2007). *Mastery of your anxiety and panic: Therapist guide* (Vol. 2). Oxford University Press.
9. Delgado Monge, I. C., Espinoza González, J., & Fonseca Castro, J. (2017). Mathematics Anxiety in College Students in Costa Rica and Their Relatonship with Academic Achievement and Socio-Demographic Variables. *Journal of Educational Psychology-Propositos y Representaciones*, *5*(1), 301-324.
10. Dew, K. H., Galassi, J. P., & Galassi, M. D. (1984). Math anxiety: relation with situational test anxiety, performance, physiological arousal, and math avoidance behavior. *Journal of counseling Psychology*, *31*(4), 580.
11. Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological assessment*, *4*(1), 26.
12. Gray, J. A. (1982). Précis of The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system. *Behavioral and brain sciences*, *5*(3), 469-484.
13. Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. *Journal for research in mathematics education*, *21*(1), 33-46.

14. Hill, F., Mammarella, I. C., Devine, A., Caviola, S., Passolunghi, M. C., & Szűcs, D. (2016). Maths anxiety in primary and secondary school students: Gender differences, developmental changes and anxiety specificity. *Learning and individual differences*, *48*, 45-53.
15. Mujtaba, T., Reiss, M. J. and Hodgson, A. (2014). Motivating and supporting young people to study mathematics: A London perspective. London Review of Education, 12(1), 121-142. https://doi.org/10.18546/LRE.12.1.11
16. Rana, R., & Mahmood, N. (2010). The relationship between test anxiety and academic achievement. *Bulletin of Education and research*, *32*(2), 63-74.
17. Ruff, S. E., & Boes, S. R. (2014). The Sum of All Fears: The Effects of Math Anxiety on Math Achievement in Fifth Grade Students and the Implications for School Counselors. *Georgia School Counselors Association Journal*, *21*(1), n1.
18. Shishigu, Aweke. (2018). Mathematics Anxiety and Prevention Strategy: An Attempt to Support Students and Strengthen Mathematics Education. Mathematics Education Trends and Research. 2018. 10.5899/2018/metr-00096
19. Smith, J. A. (2004). Reflecting on the Development of Interpretative Phenomenological Analysis and Its Contribution to Qualitative Research in Psychology. Qualitative Research in Psychology, 1, 39-54.
20. Yenilmez, Kürşat & Girginer, Nuray & Uzun, Özlem. (2007). Mathematics anxiety and attitude level of students of the Faculty of Economics and Business Administration; the Turkey model. International Mathematical Forum. 2. 10.12988/imf.2007.07181.
21. Zakariya, Y. F. (2018). Development of mathematics anxiety scale: Factor analysis as a determinant of subcategories. *Journal of Pedagogical Research*, *2*(2), 135-144.

.