

# The Relationship between Self-concept and Math Anxiety

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## ABSTRACT

The purpose was to examine the relationship between self-concept and Math anxiety. The method was descriptive of correlational type. The population was all female secondary school students in Tehran during the academic year 2017-2018, who were 82099 people. The sample size was 400 students selected using multi-stage cluster sampling method and responded to Plake & Parker Math Anxiety Rating Scale (1982), and Rodgers Self-Concept (1957). The collected data was analyzed using Pearson correlation coefficient and multivariate regression analysis. The results showed a negative and significant relationship between self-concept and Math anxiety ( $P < 0.01$ ). The results of multivariate regression analysis showed that 36.6% of the total Math anxiety is explained by self-concept. The results showed that self-concept has a significant role in predicting Math anxiety.

**Keywords:** Self-concept, Math anxiety

## Introduction

In the world today, Math has turned into a major global priority for students as their daily lives - as calculations from the school canteen to cash payments deal with Math and from technology to its application in industry - affecting everyday affairs of every individual. This is to the extent that the competence in Math is a powerful predictor of individual economic success in the future. The significance and essential role of Math in the history of the sciences and even the course of industrial and technical developments is undeniable <sup>[1]</sup>. However, in the social sciences and even in behavioral sciences, many students avoid Math or even cannot show their capacities and abilities. In other words, they face Math anxiety. Anxiety is characterized by a negative reaction in a situation where using Math knowledge is needed. This especially exists regarding school and directly related to inadequate educational experiences of the Math subject (Santos Carmo and Simonato, 2012, quoted by Barzegar Bafrovi, Kavousian, Biyabani Ali Abad and Khani, 2015) <sup>[2]</sup>.

Math anxiety comes into existence as an emotional and physiological discomfort when the student wants to do his Math homework <sup>[3]</sup>. According to the studies, several variables play a role in the prevention of students' Math anxiety, of which self-concept can be cite <sup>[4]</sup>.

Self-concept is generally a state of person's belief towards himself due to experience and mutual interaction with others. Part of the general self-concept is the individual's self-concept about education and learning, including Math self-concept that perceives a person's beliefs and feelings about his ability to study Math. Based on Timmerman, Van Luit, & Toll (2017), positive self-concept towards Math is associated with better performance in Math. As anxiety reduces the exam score, one can assume that high Math self-concept increases Math score by decreasing Math anxiety.

Self-concept is one's general evaluation of his own personality. This evaluation results from individuals' mental understanding of their own characteristics, which may be positive or negative. Positive self-concept shows that the individuals accept themselves in status of a person position with strengths and weaknesses, which increases their self-esteem in social relationships. Negative self-concept shows a feeling of worthlessness, incompetence, and disability. The most important feature of self-concept is the state that identifies individual self-concept because of mutual actions and experiences with others, and confirms the fact that self-concept is learnable and achievable over time, and teachers have a significant role in shaping students' self-concept. The role of

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working memory and self-concept of students has been confirmed in Math anxiety and a mutual negative relationship has been determined between Math anxiety and self-concept. As there is no comprehensive study to examine the relationship between self-concept and Math anxiety, the study examines whether self-concept is related to Math anxiety or not.

## Methods

The study was descriptive of correlational type. The population was all female secondary school students in Tehran during the academic year 2017-2018, who were 82099 people. According to Cochran formula, the sample size was 382 people. Considering the possible drop in returning some questionnaires and some unusable ones, sample size was considered 400. Sampling method was multi-stage cluster sampling. From the five districts (west, east, south, north, and center), one district was randomly selected of which, 10 female secondary schools were selected, and from each school two classes and from each class 20 students were selected.

## Research tool

### Math anxiety Inventory

The questionnaire is based on the revised Plake & Parker Math Anxiety Rating Scale (1982). The revised Math anxiety scale is a self-report tool with 24 items and two subscales of Math learning anxiety related to the Math learning process and numbers (items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16) and Math evaluation anxiety (items 17, 18, 19, 20, 21, 22, 23, 24) that measure the anxiety of the subject in the Math evaluation and statistics. The subject must determine the degree of his agreement or disagreement to each test item in a 5-point Likert scale (from 1 = very low anxiety to 5 = high anxiety). This test is suitable for high school and university students. To standardize the revised Math anxiety scale, Plake and Parker (1999) performed it on 170 college students who participated in three colleges of Math and statistics and obtained total alpha test as 0.98, showing desirability of the test. To test the validity of this test, using test retest method after four to six weeks, the test was again given to 91 male and 90 female subjects who participated in the first phase and the validity of the test was 0.88. Momeni, Yazdanbakhsh and Faramarzi (2015) obtained the validity of the test through Cronbach's alpha of 0.87<sup>[5]</sup>. In a study on secondary school students in Khorramabad, the validity and reliability of the questionnaire were examined. The validity of the questionnaire was calculated by calculating the correlation of the subscales of the Math anxiety questionnaire with the total score of the questionnaire, the anxiety correlation coefficients of Math learning was 0.71 and the Math anxiety was 0.70, which indicates the desirable validity of the questionnaire. Moreover, the validity of the questionnaire was examined using internal consistency on Khorramabad students and Cronbach's alpha method, where the anxiety coefficient of Math learning was 0.86, the anxiety of the Math evaluation was 0.76 and the total questionnaire was 0.91, showing the accuracy of the

questionnaire<sup>[6]</sup>. In a study on the second grade science student of Yazd, Cronbach's alpha was used to examine the internal consistency of the scale, where Cronbach's alpha coefficients were 0.88 for Math learning anxiety, 0.87 for Math anxiety evaluation and 0.92 for all questions. In this study, the internal consistency of the questionnaire was used on the female students of the second grade secondary school in Tehran using Cronbach's alpha, which was 0.81 for the Cronbach's alpha coefficient.

### Self-concept questionnaire

Self-concept questionnaire was developed by Rogers (1957). In order to measure self-concept, Rogers has created two separate forms, "A" and "B". Form "A" as base self-concept, measures how the person sees himself and the image he has now, and Form B measures the ideal self-concept that is how the person wishes to be. Each form has 25 polar traits (positive and negative). The subject must first respond to Form A and then Form B. Form A is completed with respect to an image of one's own characteristics and traits, and Form B must be completed based on wishes and ideals. The completion of the items is thus: the opposite of each attribute is written in front of it, and the subject must evaluate himself according to those two attributes and give himself a score from 1 to 7<sup>[7]</sup>. The scoring of this test is that the score of each person for each item is obtained from the difference of each attribute of Form A and B of that person: item 1 of Form A is equal to the person's score for that attribute. As there are 25 items, the grades are powered to 2 and then summed up, and then their roots are taken to obtain the score of the individual in the test. After scoring and calculating the total score of each subject according to the score obtained, the type of self-concept is determined. The total score from zero to 7 shows positive self-concept, a score of 7 to 10 shows a negative self-concept, and a score more than 10 shows the neurotic self-concept<sup>[8]</sup>. Positive self-concept means that the person has a positive image about himself. An average self-concept means that a person has a relatively negative image about himself. Negative self-concept also means that there is a possibility of psychotic distress in a person<sup>[9]</sup>. The reliability of the questionnaire was obtained by test re-test as 0.83, Cronbach's alpha as 0.77, and split-half as 0.65<sup>[10]</sup>. In another study, Cronbach's alpha for the Form A was 0.72 and for Form B 0.70<sup>[8]</sup>. In this study, the internal consistency of the questionnaire was obtained by applying it on secondary school female students of Tehran, using Cronbach's alpha as 0.83.

## Results

**Table 1: Frequency, minimum, maximum mean, and standard deviation of the variables (N = 400)**

Variables	Min.	Max.	Mean	SD
Anxiety-learning math	15	51	24.40	9.689
Anxiety-evaluation of math	10	35	17.10	6.081
Self-concept	2	7	4.75	1.731

The table above shows the frequency, minimum, maximum, mean, standard deviation in the variables, including Math anxiety and self-concept. The lowest mean and standard deviation is related to self-concept and the highest is related to the anxiety of math learning.

**Table 2: Results of Pearson correlation coefficient of self-concept and Math anxiety**

Variables	1	2	3
1. Anxiety-learning math	1		
2. Anxiety-evaluation of math	0.760**	1	
3. Self-concept	-0.547**	-0.750**	1

$P \leq 0.01^{**}$

The relationship between self-concept and Math anxiety is inverse. Thus, the research hypothesis stating a negative relationship between self-concept and Math anxiety is confirmed.

**Table 3: Summary of multivariate regression model "Math anxiety" according to self-concept aspects**

Model	Multiple correlation (R)	Squared R (coefficient of determination)	Adjusted squared R	Standard estimation error
1	0.664	0.441	0.440	11.111

The above table summarizes the multiple regression model of "Math anxiety" according to aspects of self-concept and 44.1% of the multiple variance of "Math anxiety" is based on the aspects of self-concept in interaction.

**Table 4: Analysis of variance of multiple regression model of "Math anxiety" based on self-concept aspects**

Model	Sum of squares	Degree of freedom	Mean of squares	F statistics	Sig.
Regression	38808.452	1	38808.452		
Residual	49131.548	398	123.446	314.376	0.001
Total	87940.000	399	-		

The table above shows the results of variance analysis of the multiple regression model "Math anxiety" based on self-concept aspects. Here too, as is seen, the regression model has a suitable fit and variance analysis is significant.

**Table 5: Reporting multiple regression coefficients of "Math anxiety" based on self-concept aspects**

Predicting variables	Non-standard coefficient		Standard coefficient Beta coefficient ( $\beta$ )	t	Sig.
	B	SD			
Constant	68.569	1.625	-	42.206	0.001
self-concept	-5.699	0.321	-0.664	-17.731	0.001

The above table indicates the multiple regression coefficients in the "Math anxiety" using concurrent method based on self-concept aspects. The beta self-concept coefficient was -0.664

based on the Math anxiety, so that with one unit of change in self-concept, according to the beta coefficient, in the table above, -0.664 variance in Math anxiety results in a negative change. Thus, one can state that Math anxiety is predictable based on self-concept.

## Discussion and Conclusion

The results showed that the relationship between self-concept and Math anxiety is inverse, and the first hypothesis stating a negative relationship between self-concept and Math anxiety is confirmed. This is in line with the results of Sheikhi, Shahmoradi, Barati (2016), Aghai (2014) and Sharifi Saki, Fallah and Zare (2014) [4, 11, 12]. In explaining this result, one can state that anxiety affects all areas of a person's physical and psychological aspects and includes complications such as decreasing self-esteem and self-worth, feeling incompetent, depression, and helplessness. Self-concept, understanding and judgment of individuals of themselves determine how they deal with different issues. Self-esteem is considered as a cultural shield against anxiety [13]. Having a positive self-concept is like a vital asset and value, and is one of the major factors in the flourishing of talent and creativity in individuals [14]. The feeling of high self-concept in a person creates a sense of self-confidence, and this perception enables him to adapt to difficult conditions and relieves emotions such as Math anxiety [15]. Anxiety threatens the mental health of individuals and affects their efficiency, prosperity, and social identity, and as a comprehensive and problem-causing phenomenon, can negatively affect their optimal performance and their self-concept. As there is a reciprocal relationship between individuals' perceptions of their abilities and self-concept, if one has a high self-concept, his anxiety decreases. However, a negative evaluation of performance and low self-concept increase anxiety in the person. According to what was stated above, one could conclude a negative relationship between self-concept and Math anxiety. Examining whether self-concept predicts Math anxiety negatively or not, showed that self-concept predicts Math anxiety negatively. Hence, the third hypothesis was confirmed. This result is in line with those of Sheikhi, Shahmoradi, Barati (2016), Aghai (2014) and Sharifi Saki, Fallah and Zare (2014). In explaining this hypothesis, one can state that anxious people are skeptical about their ability in doing their homework and consider failure as a sign of their inability. Thus, instead of taking action likely to fail, they try to avoid any action. Finally, this fear of initiation and refusal of effort can reduce self-esteem and self-concept [15]. People with low self-concept usually underestimate themselves, and this negative understanding of self, affects their actions, interacts with others, and creates anxiety in the individuals. Moreover, the existence of anxiety in the individual and the inability in showing the desired performance and control of anxiety, end in negative evaluations of the individual of self and the formation of stable negative beliefs in the individual, which lead to low self-concept of the individual. According to what was stated, such a result could be

considered logical so that self-concept to predict Math anxiety negatively.

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