



Construction and Standardization of Mathematical Anxiety Rating Scale for Secondary School

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Abstract

For designing mathematical anxiety rating scale first of all, factor determination is crucial, hence questionnaire was developed for mathematical anxiety and distributed to high grade and low grade math students of class nine, and their conclusion were drawn. Various factors of this study were identified. As well as many experts examined various factors of mathematical anxiety. Content analysis is done with the help of class seven, eight, nine and class ten. Same content are choosed for class nine, after critical analysis of textbook (S.S.C. board & CBSE pattern). After this content researcher took interview of expert math teacher. Also took interview of class nine students (who got maximum score & minimum score in mathematics) and statements are collected. Keeping in mind the result of questionnaire, factors generated were verified by various psychologists and educationalists. Finally, two factors/components/dimensions were determined. 1. Anxiety about Learning 2. Anxiety about Evaluation (Examination). Reliability and validity has been checked. Using this tool, it is possible to study the anxiety under the above two components. Hence Mathematical Anxiety Rating Scale (MARS) standardized.

Keywords:Standardization, Mathematical Anxiety, Secondary School

Introduction:

Most students of secondary school feel uncomfortable about mathematics which results into mathematical anxiety. There are many reasons behind this anxiety. Due to this mathematical anxiety, mathematic subject seems more complicated than any other subjects. This also affects on achievement of students. In some cases, students avoid mathematics and related subjects in their higher education. Students having mathematical anxiety decreases confidence hence score low marks (grades). Many experts examined various factors of mathematical anxiety. McCormick 1993, Noorwood 1994, Martinez & Martinez, Sovehik 1996, Brett, Woodruff &Nason, Richardson and Suinn showed mathematical anxiety affect on learning of mathematics. Richardson and Suinn observed mathematical anxiety create barrier while solving mathematics. McCormick 1993, Noorwood 1994, Martinez & Martinez, Sovehik 1996, Brett, Woodruff &Nason, Richardson and Suinn showed mathematical anxiety affect on learning of mathematics. Richardson and Suinn observed mathematical anxiety create barrier while solving mathematics. Literature on student's mathematical anxiety were also reviewed to identify factors used in past research studies of Plake and Parker, Fennema & Sherman, Wickoff & Butchalter, Sandman and Dr. Tahira Khatoon, Sadia Mahmood. Factors of mathematical anxiety were classified.

Significance of the study: Many experts examined various factors of mathematical anxiety. Which factors create mathematical anxiety? To what extent (mathematical anxiety)? If we got answer of such questions, it is easy to eliminate mathematical anxiety. Some Mathematical anxiety rating scale rating from strongly agree to strongly disagree while some scales rating from not at all anxious to very much anxious. But this 'anxious' word produce prejudice in research, so to reduce prejudice researcher used rating from strongly agree to strongly disagree. So this scale is developed to study mathematical anxiety of class nine students. This rating scale is developing and standardized by Likert technique. When we know level of mathematics anxiety, we may construct programme for removing anxiety.

Objective:-

1. To construct and standardization of mathematics anxiety rating scale.

Research Methodology: Steps in construction of Likert type Mathematical Anxiety Rating Scale (MARS):

1) **Discussion:** Formally and informally discuss different issues with the Mathematics teacher, Mathematics experts, and also consult secondary sources. Mainly in this phase researcher trying to fix dimensions of Mathematical anxiety with the help of related research, Mathematics experts and questionnaire was developed for mathematical anxiety, their conclusion were drawn. Keeping in mind the result of questionnaire, factors are confirmed. Finally, two factors were determined.

1. Anxiety about Learning
2. Anxiety about Evaluation (Examination)

2) **Review:** Review related literature to the particular topic related to Mathematical anxiety, psychological concepts and tool development. Refer journals, books, articles and net sources. Literature review helps in the process of item generation for the scale also. Interview with mathematics experts, mathematics teachers and high grade as well as low grade math students of class nine for collection of statement thrice to four hold than proposed number.

3) **Writing statements:** Based on the discussion and extensive review, collect a set of such statements on the Mathematics. Make the statement simple and clear so that respondents are able to fill out the scale quickly and easily.

Writing not at all anxious and very much anxious statements: Write very much anxious (uncomfortable, anxiety) statements or not at all anxious (Confident) statements, it should imply a different degree of anxious and not anxious behaviour towards the Mathematics. **Not at all anxious statements** should be acceptable (strongly agree) by those having no mathematical anxiety. **Very much anxious statements** should be applicable (strongly agree) to those having the Mathematical anxiety at large scale (high level).

4) **Create a statement pool:** Continue writing statements, both anxious and not anxious, until statement pool at least thrice/four hold the size to Final Draft, Investigator plan to have 20 statements in final scale, so at first phase researcher collected an item pool of 80 items. There are

20 statements in mathematical anxiety rating scale in Final form, out of that 10 belongs to anxiety about Learning math and remaining 10 belong to anxiety about Evaluation (exam). Half were about not at all anxious (Showing anxiety nothing, Confidence) and half were very much anxious (showing anxiety). The classification of (final) statements in the Mathematical anxiety rating scale is given table below.

Table 1

Classification of MARS statements

Sr. No	Content	very much anxious (uncomfortable statements)	not at all anxious (Confident statement)	Number of statements
1	Anxiety about Learning	11,13,15,17,19	1,3,5,7,9	10
2	Anxiety about Evaluation	2,4,6,8,10	12,14,16,18,20	10
Total Number of statements				20

5) **Editing of items:** After having collected as many relevant statement as possible, the next step is to go through each statement carefully. Especially collected statements are classified on the basis of frequency distribution, remaining statements are eliminated. Researcher avoid the statements which refer to past. More than one thought and double negative statements, biased languages avoided.

6) **Rank:** After editing, statements are selected and gave rating to the statements. Five categories are fairly standard. Some researcher avoid middle category as undecided as this creates research prejudice. But five point rating seem to work satisfactory. That's why researcher used five categories.

7) **Scoring Procedure for Mathematical anxiety rating scale (MARS):**

After filling MARS give them score. Five points were quantified by giving score ranging from 4 for strongly agree, 3 for disagree, 2 for undecided, 1 for disagree and 0 for strongly disagree For anxiety showing statements (very much anxious statement number 2,4,6,8,10,11,13,15,17,19). The procedure for scoring not at all anxious was reversed (confident statement no. 1,3,5,7,9,12,14,16,18,20). Score 0 for strongly agree, 1 for agree, 2 for undecided, 3 for disagree and 4 for strongly disagree. In this way anxiety about learning and anxiety about evaluation are calculated separately. Total of scores of all statements will be the total scores on scale (MARS). Given table represents scoring procedure. Scoring procedure given in table 2 below.

Table No. 2

Scoring Procedure

Sr. No.	Content	very much anxious (uncomfortable statements)	not at all anxious (Confident statement)
1	Strongly agree	4	0
2	agree	3	1
3	Undecided	2	2
4	disagree	1	3
5	Strongly disagree	0	4

8) **Instructions:** Researcher wrote instructions which clearly explain how to fill primary information and the sample statement. Instructions written in simple and easily understandable language.

9) **Formatting the scale:** Randomly order the selected items. Use letters to indicate choices such as SD, D, U, A, SA.

10) Instructions / Guidelines for administration of Mathematical Anxiety Rating Scale (MARS):

It is expected to write the initial information of the student on the first page of given scale. The teacher/administer should tell the student to fill it. Students are expected to respond to all statements. As per the intellectual capacity of class nine students should solve all statements. Sometimes students choose undecided option/rating but it affects accuracy, so in order to avoid unpredictability, administer should explain meaning of word like strongly agree to strongly disagree. Also explain sample statement on very first page with suitable example.

11) **Reliability:** First and second try out used for reliability, validity and analysis of statement. Such as difficulty value and discrimination index. Test-retest reliability, Parallel forms reliability, Inter-rater reliability, Internal consistency reliability, Average inter-item correlation, Split-half reliability are different types of reliability **Out of these types test retest method, concurrent test and split half method is determine** which is as follows, Reliability shown in below table 3.

Table 3
Reliability of MARS

Sr. No.	Method	Reliability coefficient
1	Split Half	0.812
2.	Test-Retest 3 Month	0.882
3.	Test-Retest 6 Month	0.783
4.	Concurrent test	0.751

12) **Validity:** Content analysis and Factor validity calculated. Factor validity shown in below

Table 4

Validity of MARS

Sr. No.	Content	Anxiety about Learning	Anxiety about Evaluation
1	Anxiety about Learning	☑	0.78
2.	Anxiety about Evaluation	0.78	×

13) **Interpretation of Mathematical Anxiety Rating Scale (MARS):** Compare total score of MARS with table 5 and compare sub group / factor with table 6.

Table No. 5
Interpretation of Total MARS

Score	Interpretation
54 to 80	Anxiety at High level
27 to 53	Anxiety at Medium level
00 to 26	Anxiety at Low level

Table No. 6

Interpretation of sub scale (MARS)

Score	Interpretation
27 to 40	Anxiety at High level
14 to 26	Anxiety at Medium level
00 to 13	Anxiety at Low level

Conclusion:-

This Mathematical Anxiety Rating Scale (MARS) is useful for Class IX students. The Mathematical Anxiety is composed of two sub-groups, namely the anxiety about learning and anxiety about evaluation (examination). Reliability and validity has been checked. Using this tool, it is possible to study the anxiety under the above two components. Mathematical anxiety



rating scale was constructed and developed. Item difficulty level and discrimination index are checked within first and second tryout. A statement lies between 0.20 upto 0.80 choosed for final draft. After administration collected raw data are tabulated. Mean, standard deviation, t test calculated. ThusMathematical anxiety rating scale (MARS) standardized.

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