Mathematics Anxiety Scale for Filipino College Students

Amalia E. Roldan
Occidental Mindoro State College

The study developed a Mathematics anxiety scale for Filipino college students. Items were adapted from 25–item MARS revised by Alexander and Martray (1989). The items were further explored using exploratory factor analysis to contribute on the attempt of establishing multidimensionality of the mathematics anxiety scale and to determine the other factors common among the Filipino college students. On 250 college students' scores, exploratory factor analysis extracted the 25 – item instrument into three factors with eigenvalue of 10.88, 2.21, and 1.14 respectively. The Scree test shows the smooth decrease of the eigenvalues of the identified three factors. The three factors are labelled as numerical task anxiety (9 items), mathematics test anxiety before the examination (3 items), and mathematics test anxiety during the examination (3 items). The new scale was highly consistent with the overall reliability of .94. Convergence of the three factors was determined and is significant at .01 level of significance. The new scale is valid and reliable and could be used as a screening tool, a placement tool, or a research tool.

Keywords: Mathematics anxiety, Numerical anxiety, Mathematics Test Anxiety

Mathematics anxiety has been defined as feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations (Richardson & Suinn , 1972). People who suffer from math anxiety feel that they are incapable of doing activities and classes that involve math. They experience a feeling of self-threat, resulting in the loss of interest and the loss of confidence in mathematics learning (Tobias, 1993). According to Luo et al. (2009), mathematics anxiety is a kind of disease. It is a cognitively passive mood produced by mathematics. Students experience unhealthy mood responses when they encounter mathematics problems and manifest themselves as being panicky and losing one's head, depressed and helpless,

nervous and fearful, and so on. At the same time, it is accompanied by some physiological reactions, such as perspiration of the palms, holding tight the fists, being sick, vomiting, dry lips, and pale face.

The incidence of math anxiety is a common experience among Filipino students. Many students have even chosen their college major in the basis of how little math is required for the degree. However, with the demand of the higher education in the Philippines, most of the college curriculums require a large number of units in mathematics. Students have no option but to take mathematics as one of the core subjects. On the other hand, mathematics anxiety is emotional, rather than intellectual, but it was found out that it interferes with a person's ability to learn math and resulted to an intellectual problem (Tobias, 1993). Many adults are blocked from professional and technical job opportunities because they fear or perform poorly in mathematics considering that most of them are brain-capable of learning more mathematics (Curtain, 1999).

Mathematics Anxiety

Research on mathematics anxiety has started in the 1950s with the personal observations of mathematics teachers. Dreger and Aiken (1957) noticed undergraduate college students reacting emotionally to arithmetic and mathematics. Although the reaction appeared to be similar to test anxiety in general, they found that mathematics anxiety is a potential factor prose. They have labelled it 'number anxiety', which is often assumed to be a high level of anxiety impairs performance. Even though mathematics anxiety has been conceptualized to be a difficult construct to measure; nonetheless, several attempts have been made to assess it in the literature.

Three distinct periods in the measurement of mathematics anxiety had been described by Atkinson (1988). In the first period, most studies were merely the authors' opinions and did not employ any standardized mathematics anxiety measures. During this period, an awareness of anxiety about mathematics arose and mathematics anxiety was being defined (e. g., Gough, 1954). On the other hand, studies on the second period focused on assessing attitudes toward mathematics through surveys that included several variables such as state-trait anxiety, confidence, enjoyment, misconceptions, and attitudes toward mathematics (e. g., Dutton & Blum, 1968). The third period presented the development and refinement of the standardized mathematics anxiety instruments.

The first mathematics anxiety instrument is the Number Anxiety Scale developed by Dreger and Aiken in 1957. It is based from the modification of the Taylor Manifest Anxiety Scale (Taylor, 1953). The instrument relied on the definition of mathemaphobia by Gough (1954), constructed a 3-item scale of number anxiety, defined as the "presence of a syndrome of emotional reactions to arithmetic and mathematics" (Dreger & Aiken, 1957, p. 344).

Afterwards, more comprehensive scales such as the Mathematics Anxiety Rating Scale (MARS; Richardson & Suinn, 1972), the Fennema-Sherman Mathematics Attitudes Scales (Fennema & Sherman, 1976), the Anxiety toward Mathematics Scale (Sandman, 1980) and the Mathematics Anxiety Questionnaire (Wigfield & Meece, 1988) were

developed. Of all these measures, the Mathematics Anxiety Rating Scale (Richardson & Suinn, 1972) has consistently been the most frequently employed mathematics anxiety measure in the literature. The sole purpose of the instrument is for treatment or research use. It may also be a valuable assessment instrument for those who wish to do research on psychotherapy in general or mathematics anxiety in particular. The therapist may use the scale for screening clients with severe mathematics anxiety by comparing their scores with the normative data. If desensitization behavior therapy is used, a mathematics anxiety hierarchy may be constructed directly from the MARS since the MARS requires the client to check the level of anxiety associated with each item, and he is basically ranking the items in hierarchical manner.

The MARS is a 98-item, a 5-point, Likert-type instrument that assesses the levels of anxiety in situations involving numbers (Richardson, & Suinn, 1972). The instrument asks participants to rate each item for "how much they are frightened by mathematics nowadays" (Richardson & Suinn, 1972, p. 1). The sum of the items gives a total score, where higher scores indicate higher levels of mathematics anxiety (Richardson & Suinn, 1972). The normative data of the instrument were collected on a sample of 397 college students. The instrument has high test-retest (r=.85) and internal consistency reliability (r= .97). Evidence for validity comes from three studies in which MARS scores showed expected decreases following behavior therapy for mathematics anxiety, and a separate validity study in which MARS scores were found to correlate negatively with scores on a mathematics test. The measure has also been translated into many other languages and validated in other populations.

Alexander and Matray (1989) reported two major shortcomings on the 98 item MARS (Richardson & Suinn, 1972). The first shortcoming is that the proposed underlying construct of the MARS is unidimensional but later studies revealed that there may instead be more than one underlying construct (Alexander & Cobb, 1984; Alexander & Martay, 1989; Brush, 1978; Rounds & Hender, 1980). The second shortcoming is a very long assessment instrument (98-items) that requires a large amount of time to administer and to score.

The issue of the unidimensionality of the MARS is especially crucial for interpretation of pre therapy to post therapy validity studies. Post therapy decreases in MARS scores (Hendel & Davis, 1978; Hyman, 1974; Richardson & Suinn, 1972) could be accounted for by as few as 20% of the 98 MARS items. Furthermore, several of these studies may have used the MARS items or very similar items in a desensitization hierarchy, a practice advocated by Richardson and Suinn (1972) and Hendel and Davis (1978). In turn, this practice could also confound the results of this pre therapy to post therapy studies. If the MARS is multidimensional, pre therapy to post therapy decreases in MARS scores could presumably be accounted for by dimension(s) that may or may not be mathematics anxiety (Rounds & Hendel, 1980).

The major shortcomings were addressed by the different math anxiety researchers. Several attempts to develop an abbreviated version of the 98-item MARS (Richardson & Suinn, 1972) were conducted (e. g., Brush, 1978; Rounds & Hendel, 1980; Plake & Parker, 1982; Alexander & Martray, 1989). The first study was conducted by Brush (1978). She administered the 94-item MARS and the Suinn Test Anxiety Behavior Scale (STABS) to two samples of undergraduates. The STABS contains 50 items describing behavioral situations related to test anxiety and uses a 5-point

Likert scale (Anderson & Sauser, 1995). Sample 1 consisted of 109 upperclassmen and sample 2 had 80 upperclassmen. Both samples contained students that majored in Humanities, Social Science, or Physical Science. Participants in both samples completed the MARS. Participants in sample 1 also answered questions about amount of mathematical training, level of performance in courses, and degree of dislike of and anxiety about mathematics, while the participants in the second sample completed the STABS. A principal factor analysis with a varimax rotation was used to isolate two factors from the 94-item MARS. While 45 items were found to exhibit problem-solving anxiety (e. g., adding up 976 + 977 on paper; figuring the sales tax on a purchase that costs more than $1.00), only 31 items were associated with evaluation anxiety (e. g., thinking about an upcoming math test one day before; being given a homework assignment of many difficult problems which is due the next class meeting) (Brush, 1978).

Using the same instrument by Richarch and Suin (1972), Rounds and Hendel (1980) examined the instrument's dimensionality. The responses to 94 MARS items were obtained for 350 female participants in a mathematics-anxiety program. The items were inter correlated, and the correlation matrix was factored by a principal-axes technique, using squared multiple correlations as communality estimates, with rotation to a direct oblimin and varimax criterion. Two factors were identified and labelled as Mathematics Text Anxiety and Numerical Anxiety. Factor-derived scales were developed and correlated with five specific anxiety scales and an arithmetic test. The factor interpretations were supported by the expected discriminant and convergent relationship among these scales.

The 94-item MARS was also used by Rounds and Hendel (1980). An arithmetic placement test and four other anxiety scales were used in this study. The four anxiety scale include the Suinn Test Anxiety Behavior Scale (STABS) by Brush (1978), the Achievement Anxiety Test (AAT) by Alpert and Haber, a 19-item scale which measures the facilitating and debilitating effects of anxiety on achievement performance, the Fear of Negative Evaluation Scale (FNE) by Watson and Friend, a 17 true and 13 false items that measures social-evaluative anxiety and the Fennema-Sherman Math Anxiety Scale (MAS) that contains 12-items and uses a 5-point Likert-type scale (Anderson & Sauser, 1995).

Participants for the Rounds and Hendel (1980) study were females taking part in a mathematics-anxiety treatment program at a large Midwestern university. The 350 participants completed the MARS. In addition, 67 of the participants completed the STABS, AAT, FNE, and the arithmetic placement test, while 111 of the participants completed the MAS and the arithmetic placement test. The results of the factor analysis showed the first factor to be a measure of mathematics test anxiety or mathematics course anxiety. Rounds and Hendel labeled this factor Mathematics Test Anxiety. Items contributing to the second factor referred to everyday, concrete situations requiring some form of number manipulation. This factor was labeled Numerical Anxiety (Rounds & Hendel, 1980).

Plake and Parker (1982) is another study that made revision on the 98 item MARS. This version contained 24 items from the original 98-item MARS. Other anxiety instruments used were the Achievement Anxiety Test (AAT) by Alpert and Haber and the State Trait Anxiety Invertory (STAI) by Spielberger, Gorsuch, and Lushene. The

STAI consists of two 20-item 4-point rating scales. The State Anxiety Subscale of the STAI measures anxiety specific to some situation such as taking a test. The Trait Anxiety Subscale of the STAI measures a participant's proneness to anxiety (Anderson & Sauser, 1995). A 48-item Mathematics Achievement Test (MAT) was derived from an item pool associated with the College Mathematics Placement Program of the American College Testing Program. Participants included 170 graduate students enrolled in an Introduction to Statistics course. Most of the participants were education students. A packet containing the AAT, revised MARS, STAI-STATE, and STAI-TRAIT was given to each student, along with the MAT, as they entered the classroom. The results of the factor analysis found 16 items of the revised MARS related to the activity or process of studying statistics. This factor was labelled Learning Mathematics Anxiety. The remaining eight items were concerned with the evaluation of mathematics or statistics learning and formed the second factor called Mathematics Evaluation Anxiety.

From the two-factor structures of mathematics anxiety scale, in 1989, Alexander and Martray designed an abbreviated version of the MARS. This version was designed with the belief that "math anxiety is defined primarily by a math test (or evaluation) anxiety component and secondarily by anxiety about executing math tasks or taking math courses" (Alexander & Martray, 1989, p. 144). The initial construct validity of the instrument was obtained from a sample of 517 undergraduate students (Alexander & Martray, 1989). To develop the 25-item version, Alexander and Martray (1989) performed a factor analysis on a 69-item abbreviated version of the original 98-item MARS. The correlation between scores on the 69-item scale and the 98-item scale was .93. An internal consistency alpha coefficient of .97 was obtained for the 69-item scale. The correlation between scores on the 25-item MARS and the 69-item MARS was .93. Two-week test-retest reliability of the abbreviated (25-item) scale was .86. An internal consistency alpha coefficient for the25-item MARS was computed in this study. The principal component factor analysis with squared multiple correlations as initial communality estimates and with a varimax rotation of the 69-item-version MARS revealed three factors, Mathematics Test Anxiety, Mathematics Course Anxiety, and Numerical Test Anxiety, which accounted for 31% of the variance in the RMARS scores.

Mathematics Test Anxiety is a condition where in someone is emotionally or physically experiences distress at prior, during or after taking a mathematics exam. It is generally caused by a negative experience a person had because of a certain exam. It can be experienced before (lack or overdoing the preparation), ongoing (mental block) and after (panic every after test she encounters) the examinations. In the study of Alexander and Martray (1989), the Mathematics Test Anxiety subscale assesses student reactions to evaluative situations in mathematics. The students are asked how much frightened they are in taking an exam (quiz) in a Math course and thinking about the upcoming math test 1 week before.

On the other hand, the Mathematics Course Anxiety subscale is designed to measure student reactions to being in a mathematics class. The students are asked how much frightened they are walking into a math course or when buying a Math textbook.

The Numerical Task Anxiety is the third subscale that measures anxiety due to basic math activities such as multiplication and division. The students are asked how much frightened they are solving a set of numerical problems involving addition, subtraction, multiplication and division to solve on a paper.

With the several studies conducted on the development of Mathematics Anxiety scale, from the original 98-item unidimensional measure (Richard & Suinn, 1972) to the different revisions done attempting to develop an abbreviated version of the instrument (Brush, 1978; Rounds & Hendel, 1980; Plake & Parker, 1982) and up to the last 3-factor version of Alexander and Martray (1989), it was found out that there is no consistent common factor aside from Numerical Anxiety and Mathematics Test Anxiety. The multidimensionality of the instrument was not yet fully established. Another finding is that most of the literatures on the development of Mathematics anxiety scales were conducted from Western (Brush, 1978; Rounds & Hendel, 1980; Plake & Parker, 1982, Alexander & Martray, 1989) and few from Asian (Bagolbu, 2003) countries but no attempt was done using Filipino samples.

The present study was conducted for two main reasons. First, to contribute on establishing the multidimensionality of the mathematics anxiety scale and second is to determine the other factors common among the Filipino college students.

Method

Research Design

The current study utilized exploratory factor Analysis. Exploratory factor analysis was used for the reason that the multidimensionality of the Mathematics anxiety scale has not been fully determined. To reduce the number of items and detect structure in the relationships between the items, the Principal Component Analysis (PCA) was used. The PCA combines items that are highly correlated with each other. All items with factor loading of .5 were included in the new scale.

Participants

The new revised MAS scale was administered to the 250 college freshmen of Occidental Mindoro State College, San Jose, Occidental Mindoro. The participants are currently taking Mathematics subjects like Basic Mathematics and Algebra. Items were randomly arranged and the respondents answered by checking the number that corresponds to their answer.

Instrument

The construct definition and content domain of the new Mathematics anxiety scale is taken from the previous studies on the development of Mathematics Anxiety Rating Scale. From the original 98-item MARS (Richard & Suin, 1972), a unidimensional measure, the items were reduced but were created into two-factors structure (Alexander & Cobb, 1984; Rounds & Hender, 1980; Brush, 1978) and the recent three-factors structure developed by Alexander and Martray (1989). The following studies

show that there are several instruments existing (with their respective psychometric properties) to measure the mathematics anxiety among college students. However, the multidimensionality of the instrument adapted to Filipino college students if not are less explored and established.

The items of Mathematics Anxiety Scale for Filipino College Students were adapted from Mathematics Anxiety Rating Scale revised by Alexander and Martray (1989). The new MARS scale consists of 25 items tells about mathematics related tasks experienced by Filipino college students. Based from recent revision of the MARS scale (Alexander & Martray, 1989), the items are classified into three factors: Mathematics test anxiety, Mathematics course anxiety and the numerical tasks anxiety. Using a five point scale, the students were requested to rate their levels of fear or apprehension with the tasks using the dimensions of 1- "not at all", 2- "a little", 3- "a fair amount", 4- "much", or 5- "very much". For the item review, the 25-item scale was presented to some Mathematics teachers to check their appropriateness.

Data Analysis

To further determine the factor structures of the new MAS scale, the exploratory factor analysis was constructed. The items that had a factor loading of .5 and above were selected and included in the final form of the scale. The process was repeated many times until the eigenvalues tend closer to 1. For the validity of the factors, the eigenvalues should be greater than 1. Scree test was also used to assess the obtained eigenvalues. The factors are rotated using the varimax rotation where the variances of the squared factor loadings are maximized.

To test the reliability of the scale, the internal consistency method using Cronbach's alpha was calculated and the Principal Component Analysis for construct validation.

Results

Exploratory Factor Analysis

The principal component analysis procedure extracted three factors. The eigenvalues of the three factors were 10.88, 2.21, and 1.14 respectively. The instrument initially has three factors estimated by Cattell's (1966) scree test (see Alexander & Marthray, 1989). Trial rotations with the direct varimax raw criteria of 2-4 factors indicated that a three-factor solution provided the most interpretable structure. The analysis was set to include factor loadings of .5 and above. According to Netemeyer et. al. (2003), a second rule of thumb for retaining factors pertains to the number of items that substantially load on a factor. The items with factor loading of .40 and above have been classified as substantial (Floyd & Widaman, 1995), and loadings above .50 have been considered as "very significant" (Hair et al., 1988). The first factor obtained a high eigenvalue of 10.88 which explains 60% of the variance. Factor 1 had nine high loading items that refer to everyday, concrete situations requiring some form of number manipulation (such as addition and multiplication). The factor loadings of the items in this factor range from .62 to .81. The majority of

the items in factor 1 (4 items or 44%) was referred to the use of elementary arithmetic skills without its context for the application (e. g., Items 16, 17, 18, and 19). The two (22%) of the 9 items indicate the student's apprehension in picking up and opening Math text books to begin working on a homework assignment (Items 1 and 14). The other two (22%) items included is about the apprehension of the student when their teacher or somebody is explaining the formula or working on some algebraic equations (Items 20 & 24). And the last 1 (11%) item tells about the student's apprehension on reading a cash register receipt after a certain purchase (Item 5). Other items with factor loading less than .5 were not included in the analysis. The interpretation of the items in Factor 1 is labelled as Numerical Task Anxiety.

The second factor with eigenvalue of 2.21 was loaded with three items. The items in this factor obtained mean loading of .71 with the highest factor loading of .83 and the lowest of .53. The three items reflect the apprehension of the students in the preparation for their Math test. Thinking for the upcoming Math test one day or one hour before are sample items in this factor. The interpretation of items in factor 2 is labelled as Mathematics Test Anxiety before the examination.

The third factor with eigenvalue of 1.14 was also loaded by three items. The items have factor loadings range from .50 to .70. Items measure the apprehension of the students while taking an examination in a Math course (Items 13, 21, and 23) or during the college entrance examination. Based on the interpretation of these items, the third factor is labelled as Mathematics Test Anxiety during the examination.

The items of new constructed MAS instrument together with the obtained factor loadings are presented in table 1.

Ten out of the 25 items in the previous MAS items adapted from Alexamder and Martray (1989) were dropped in the instrument. These items obtained factor loadings of less than. 5. Dropped items tell about the apprehension of the students in buying a math book, studying for a math test and others are found similar to the items included in the derived factors.

The Scree Test

The Scree test in figure 1 confirmed the derived factors in the new scale. The graph shows four factors that can be traced above the eigenvalue of 1. The first two factors identified have eigenvalues of 10.88 (factor1) and 2.21 (Factor 2). The first factor reflects the numerical anxiety while the second factor is mathematics test anxiety before the examination. The other two factors having eigenvalues of greater than 1 (1.14 and 1.11) are also considered and labelled as Mathematics test anxiety during the examination and mathematics test anxiety after the examination. Since the last factor having eigenvalue of 1.11 has a very small difference from the third factor with eigenvalue of 1.14 (Mathematics test anxiety during the examination) and later found out that it has only one item, thus, this study considers only the first three factors.

Table 1
MAS items With Factor Loadings for Factor 1, Factor 2, Factor 3, and Factor 4

	Mathematics Anxiety Items	Factor loading
	Factor 1 (Numerical Task Anxiety)	
Item 1	Picking up math textbook to begin working on a homework assignment	.62
Item 5	Reading a cash register receipt after a purchase	.77
Item 14	Opening a Math book and found a page full of problems to solve	.67
Item 16	Being given a set of numerical problems involving addition	.79
Item 17	Being given a set of numerical problems involving subtraction	.71
Item 18	Being given a set of numerical problems involving multiplication	.81
Item 19	Being given a set of numerical problems involving division	.81
Item 20	Watching a teacher work on an algebraic equation on the blackboard	.80
Item 24	Listening to another student explaining a math formula	.79
	Factor 2 (Mathematics Test Anxiety before the Exam)	
Item 10	Getting ready to study for a math test	.53
Item 8	Thinking about an upcoming math test one day before	.77
Item 9	Thinking about an upcoming math test one hour before	.83
	Factor 3(Mathematics Test Anxiety during the Exam)	
Item 13	Taking math section of college entrance exam	.55
Item 21	Taking an exam (quiz) in a math course	.50
Item 23	Taking an exam (final) in a math course	.70

MAS – Mathematics Anxiety Scale

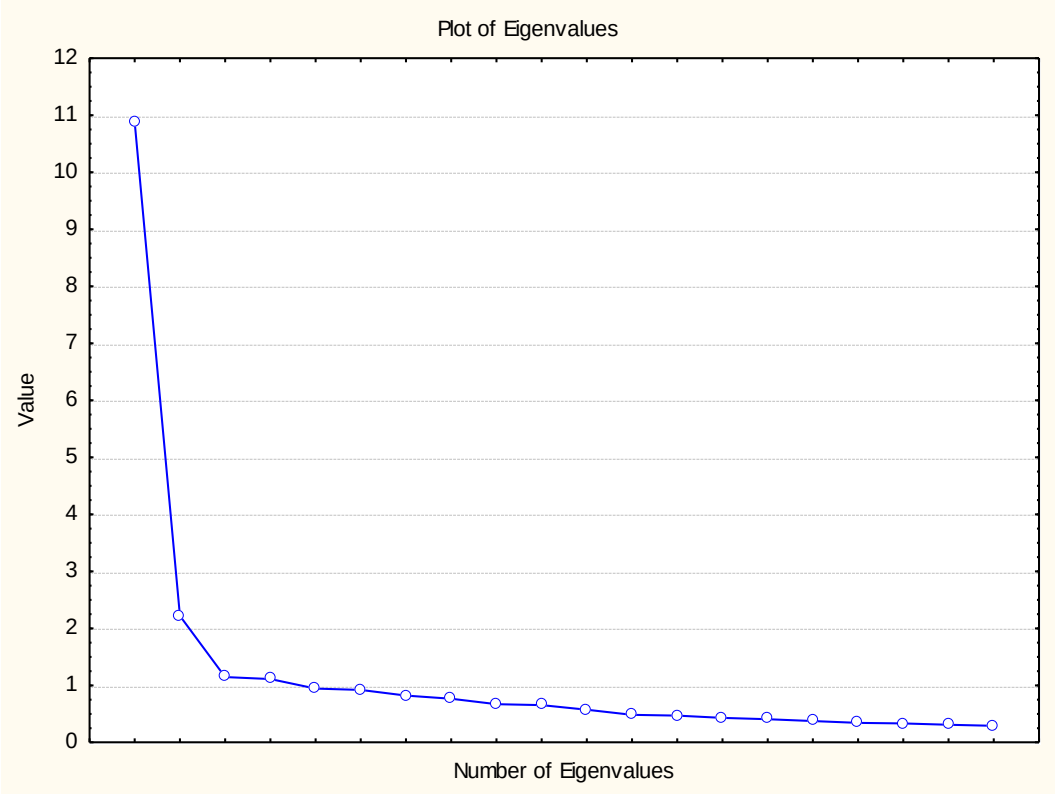

Figure 1. Scree Plot for the Factor Extraction for the Item

Score Distribution, Reliability and Factor Correlations

After the factors have been identified using the exploratory factor analysis, descriptive statistics were computed and analyzed. The means, standard deviation, and reliability coefficients are presented in Table 2. The total item mean was 3.09 with standard deviation of .74. A fair amount of anxiety on the whole items in the instrument was reflected among the participants.

Table 2
Means, Standard Deviation, and Reliability Coefficients of the New MAS

	N	Mean	SD	Cronbach's Alpha
MAS	250	3.09	.74	.94
Numerical Task Anxiety	250	3.18	.96	.94
Math Test Anxiety before the Exam	250	3.22	.91	.79
Math Test Anxiety during the Exam	250	2.88	.78	.67

The findings are consistent in three extracted factors having mean scores range from 2.88 to 3.22 which area above the median. The Cronbach's alpha values of the first two factors are .94 (Numerical Task Anxiety), and .79 (Mathematics Test anxiety before the examination) respectively indicates high reliability while the third factor

(Math anxiety during the examination) had value of .67 indicates moderate reliability. The overall internal consistency is also high (.94) that signifies high reliability of the scale.

Convergence of the four factors derived was measured also using the Pearson r. Results of the correlations were reported in table 3. The correlation coefficients showed that the four derived factors have significant relationships at .01 margin of error.

Table 2
Correlation Matrix of the Factors of Mathematics Anxiety Scale

	(1)	(2)	(3)
(1) Numerical Task Anxiety	1.00	0.526**	.496**
(2) Math Test Anxiety before the Exam		1.00	.503**
(3) Math Test Anxiety during the Exam			1.00

**p<.01

The correlation coefficients range from .496 to .526 show positive linear relationship among the factors. This means that as the dimension of first factor increases the dimension of the others also increases. The magnitude of the relationships indicates moderate relationship between the factors. The result indicates that the four factors are convergence.

Discussion

The result of the present study indicated that contrary to previous statements (Richard & Suin, 1972), mathematics anxiety as measured by the MARS is not a unidimensional measure. Like in the other abbreviated revised measures (Alexander & Cobb, 1984; Rounds & Hendel, 1980; Brush, 1978; Alexander & Martray, 1989) the present study generated three factors, the numerical task anxiety (9 items), mathematics test anxiety before the examination (3 items) and the mathematics test anxiety during the examination (3 items). The correlation coefficients of the three factors derived in the scale conforms the convergence of the scale while the scree test further confirmed the factor analytic interpretations of the scale. The high internal consistency result (α= .94) of the present scale supports Rounds and Hendel (1980) findings that factor derived scales are highly internally consistent and show expected convergent and divergent relationship with other unidimensional scale.

Moreover, the findings of the study are also different from the three factor scale of Alexander and Martray (1989): The numerical task anxiety, mathematics anxiety and mathematics course anxiety. Although the same items were used, result of the factor analysis showed that no identified factor for mathematics course anxiety. Items of this factor combine in the three factors of test anxiety and some were not included in the final draft of the scale because of the low factor loadings.

The result of the study showed that for Filipino college students, the domains of the mathematics anxiety are described not by the course anxiety but more dominant on the anxiety about everyday numerical manipulation and test anxiety. The causes of their fear in numerical and test anxiety is not in the context of this study but the results show that most of the participants lack the basic skills in mathematics since most of the highly loaded items are taught in the elementary levels.

Another factor is the Mathematics test anxiety. Nolting (1999) found out that anxiety and nervousness can be obstacles to doing well on math tests. A certain degree of tension is expected to happen that impede a student to focus on, and can inhibit the ability to think clear. What different in the current study is the second and third factors. The two factors identify when the anxiety happens among the students in taking the Mathematics examinations. This instrument determines and measures how much anxiety the student experienced before and during the examinations. Identifying when the anxiety was most evident among the student will help the teachers or the students itself do some techniques to overcome the test anxiety and gain more confidence in taking the examination.

The new 25–items mathematics anxiety was reduced to 15 items. The exploratory factor analysis had identified three factors with eigenvalues greater than 1. The first factor has eigenvalue of 10.88 and labelled as Mathematics task anxiety (9 items). The second factor has eigenvalue of 2.21 labelled as Mathematics test anxiety before the examination. Lastly the third factor with eigenvalue of 1.14 is labelled as mathematics test anxiety during the examination. The significant results of the inter item correlation confirmed the convergence of the extracted factors.

In conclusion, math anxiety is very real and occurs among thousands of people. Much of this anxiety happens in the classroom due to the lack of consideration of different learning styles of students. Today, the needs of society require a greater need for mathematics. Math must be looked upon in a positive light to reduce math anxiety. Therefore, teachers must re-examine traditional teaching methods which often do not match students' learning styles and skills needed in society. Lessons must be presented in a variety of ways. For instance, a new concept can be taught through play acting, cooperative groups, visual aids, hands on activities and technology. As a result once young children see math as fun, they will enjoy it, and, the joy of mathematics could remain with them throughout the rest of their lives. The new scale can be used to support instruction, screening tool, a placement tool, or a research tool.

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Appendix
MATHEMATICS ANXIETY SCALE

I fell anxious when...

Picking up math textbook to begin working on a homework assignment	1 2 3 4 5
Realizing that you have to take several Math exam s to pass the course	1 2 3 4 5
Taking another Math course	1 2 3 4 5
Receiving an examination result through mail	1 2 3 4 5
Reading a cash register receipt after a purchase	1 2 3 4 5
Being given homework assignments of many	1 2 3 4 5
difficult problems that are due the next class meeting	1 2 3 4 5
Thinking about an upcoming math test I week before	1 2 3 4 5
Thinking about an upcoming math test 1 day before	1 2 3 4 5
Thinking about an upcoming math test 1 hour before	1 2 3 4 5
Getting ready to start a Math test	1 2 3 4 5
Studying for a Math test	1 2 3 4 5
Picking up math textbook to begin a difficult reading assignment	1 2 3 4 5
Taking math section of college entrance exam	1 2 3 4 5
Opening a math or stat book and seeing a page full of problems	1 2 3 4 5
Being given a"pop" quiz in a Math class	1 2 3 4 5
Being given a set of numerical problems involving addition to solve on paper	1 2 3 4 5
Being given a set of subtraction problems to solve	1 2 3 4 5
Being given a set of multiplication problems to solve	1 2 3 4 5
Being given a set of division problems to solve	1 2 3 4 5
Watching a teacher work on an algebraic equation on the blackboard	1 2 3 4 5
Taking an exam (quiz) in a Math course	1 2 3 4 5
Walking into a Math course	1 2 3 4 5
Taking an exam (final) in a Math course	1 2 3 4 5
Listening to another student explaining a math formula	1 2 3 4 5
Buying a Mathematics Textbook	1 2 3 4 5