# The Single-Item Math Anxiety Scale (SIMA): An Alternative Way of Measuring Mathematical Anxiety

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**Abstract**

This study examined whether the Single-Item Math Anxiety scale (SIMA), based on the item suggested by Ashcraft (2002), provided valid and reliable scores of mathematical anxiety. A large sample of university students (n=279) was administered the SIMA and the 25-item Abbreviated Math Anxiety Rating Scale (sMARS; Alexander & Martray, 1989) to evaluate the relation between the scores of the two measures. The university students were also administered other tests to provide validity evidence for the SIMA scores. The temporal stability of the SIMA scores was also evaluated over a 7-week test-retest interval. The findings of the study demonstrated that the SIMA scores showed evidence of validity and strong test-retest reliability. We advocate for the use of the SIMA as a quick and useful means of assessing math anxiety, particularly in research and educational settings when large samples have to be assessed.

**Keywords:** mathematics anxiety; mathematical education; assessment; psychometric properties; single item.

# The Single-Item Math Anxiety Scale (SIMA): An Alternative Way of Measuring Mathematical Anxiety

Richardson and Suinn (1972) defined mathematical anxiety as feelings of tension, apprehension, or fear that interfere with math performance. In recent years the cognitive consequences of mathematical anxiety have attracted increasing interest among cognitive psychologists, who have devoted a great deal of effort to studying the differences in numerical and mathematical processing related to different levels of math anxiety (for a review, see Ashcraft and Ridley, 2005). It has been widely demonstrated that individuals with high levels of math anxiety perform worse than their peers with low levels of anxiety in simple numerical tasks, such as counting or numerical comparison (Maloney, Ansari & Fugelsang, 2011; Maloney, Risko, Ansari & Fugelsang, 2010), and also in more complex mathematical tasks, such as solving arithmetical problems with carrying (Ashcraft & Faust, 1994; Faust, Ashcraft & Fleck, 1996; Kellogg, Hopko & Ashcraft, 1999). To conduct these experiments, researchers usually administered math anxiety tests to large samples in order to form groups with extreme scores on this construct. Here we present an instrument that will allow researchers interested in studying the cognitive consequences of mathematical anxiety to obtain valid and reliable mathematical scores in a quick and easy way.

Since Richardson and Suinn (1972) proposed the 98-item Math Anxiety Rating Scale (MARS) to measure math anxiety, several math anxiety tests have been developed: the 12-item Fennema-Sherman Mathematics Anxiety Scale (MAS; Fennema & Sherman, 1976), the 6-item Sandman Anxiety Toward Mathematics Scale (ATMS; Sandman, 1980), the 24-item Math Anxiety Rating Scale-Revised (MARS-R; Plake & Parker, 1982), the MARS for Adolescents (Suinn & Edwards, 1982), the MARS for Elementary School Students (Suinn, Taylor & Edwards, 1988), the 25-item Abbreviated Math Anxiety Rating

Scale (sMARS; Alexander & Martray, 1989), the 9-item Abbreviated Math Anxiety Scale (AMAS; Hopko, Mahadevan, Bare & Hunt, 2003) and the 23-item Mathematics Anxiety Scale-UK (MAS-UK; Hunt, Clark-Carter & Sheffield, 2011). All of these tests are shorter version of the original MARS and were created with the objective of providing less time-consuming instruments to assess math anxiety. In 2002 Ashcraft described a simpler way of measuring mathematics anxiety. He proposed merely asking participants “On a scale from 1 to 10, how math anxious are you?” He used this single-item question in his laboratory and found that responses to this one question correlated with scores on the sMARS anywhere from .49 to .85 (Ashcraft, 2002).

Gorsuch and colleagues (1972, 1989) were the first to support the use of single-item scales to obtain valid and reliable measurements. Since then, several single-item scales have been developed to measure constructs such as quality of life (de Boher, Lanschot, Stalmeier, Sandick, Hulscher, Haes & Sprangers, 2004; Yohannes, Dodd, Morris & Webb, 2011), job satisfaction (Nagy, 2002), burnout (Rohland, Kruse & Rohrer, 2004) and depression (Ayalon, Goldfracht & Bech, 2009; Chochinov, Wilson, Enns & Lander, 1997; Mahoney, Drinka, Abler, Gunterhunt, Matthews, Gravenstein & Carnes, 1994), among others. The main advantage of single-item scales over multiple-item scales is that they are quicker and easier to administer (especially when large samples have to be assessed). The present study aimed to determine whether the Single-Item Math Anxiety scale (SIMA), based on the item suggested by Ashcraft (2002), could provide valid and reliable scores of math anxiety.

In the present study, a large sample of university students ($n$ = 279) was administered the SIMA and the sMARS (Alexander & Martray, 1989) in order to evaluate the relation between the scores of these two measures. Participants were also administered other tests in order to provide evidence for the validity of the SIMA scores: the Addition and Subtraction Verification Test from the French kit (French, Ekstrom & Price, 1963), a Single-digit Addition Test created by the authors for the present study, the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983) and three scales (Spatial Visualization, Reasoning and Verbal Ability) from the Thurstone's Primary Mental Abilities Test (PMA; Thurstone, 1939). Participants' attitudes toward mathematics and information about their high-school itinerary were also collected. Finally, to assess the temporal stability of the SIMA scores, the SIMA was administered to some of the university students twice, seven weeks apart.

To assess the construct validity of the SIMA scores, we made several predictions based on reviewing the results of Hembree's meta-analysis (1990). In his meta-analysis, Hembree integrated the findings of 151 studies on mathematical anxiety and synthesized the relationships between math anxiety and other aptitudes and psychological constructs. Based on these results, we made the following predictions. First, we expected the SIMA scores to be negatively related to arithmetic performance in multi-digit additions and subtractions (measured by the Addition and Subtraction Verification Test from the French kit), because previous research had demonstrated that high-math anxious individuals perform worse than their low-math anxious peers on these arithmetic operations (Ashcraft & Faust, 1994; Faust et al. 1996; Kellogg, et al., 1999). Second, we predicted a small relation between the SIMA and the Simple-Addition Test scores because according to Ashcraft and colleagues (Ashcraft, Kirk & Hopko, 2000; Ashcraft & Faust, 1994; Faust,et al., 1996) math anxiety has a small impact on simple-addition performance. Third, the SIMA scores would be moderately related with state and trait anxiety. This prediction was based on data reported in Hembree's meta-analysis (1990), where mean correlations between math anxiety and state and trait anxiety of .42 and .38, respectively, were reported. These moderate correlations are usually taken as evidence that math anxiety is a similar but a separate construct from state and trait anxiety (Dreger & Aiken, 1957). Fourth, regarding PMA scores, we predicted that the SIMA scores would not be related either to reasoning or verbal abilities, and would be moderately related with spatial ability (the higher one's math anxiety, the lower one's spatial ability). These predictions are based on the correlations reported by Hembree of -.06, -.17 and -.29 between math anxiety and these three abilities, respectively. Fifth, we expected strong inverse correlations between SIMA scores and the degree of students' enjoyment, motivation and self-confidence in mathematics, because these negative relations have been widely reported (-.47, -.64 and -.65, respectively, in Hembree's meta-analysis). Finally, we expected females to have higher SIMA scores than males (Hembree, 1990; Hyde, Fennema, Ryan, Frost & Hopp, 1990), and individuals who followed high-school itineraries[1] with little mathematical content to have higher SIMA scores than those following itineraries that involved a great deal of mathematics and calculation (LeFevre, Kulak & Heymans, 1992).

## Method

### Participants

Participants were 210 women (75.26 %) with a mean age of 20.79 years (*SD* = 3.48) and 69 men (24.64%) with a mean age of 21.07 years (*SD* = 2.73). They were first- and second-year bachelor students majoring in psychology at the University of Barcelona (Spain), and had previously graduated from high school with a concentration in social science (32.3%), science (22.9%), humanities (20.4%), technology (6.8%) or other (3.9%).

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[1] Itinerary refers to the concentration or area of interest during high-school studies ("Bachillerato" in Spanish), thus before enrolling in University. In the Spanish educational system, students graduate from high school with a concentration in one of the following areas: social science, science, humanities, technology or other.

In the current Spanish education system, science and technology high school itineraries are characterized by a high degree of mathematical content, whereas the humanities and social science pathways involve considerably less or no mathematical content.

Psychometric properties of the SIMA scores were evaluated in five convenience and voluntary subsamples, all of them proceeding from the original one. Descriptive statistics and the information collected from each subsample are shown in Table 1.

INSERT TABLE 1 ABOUT HERE

Test score stability was obtained by analyzing a subsample of 82 students from the original sample of 279 students. This subsample consisted of 63 women (mean age = 20.82; *SD* = 3.15) and 19 men (mean age = 21.22; *SD* = 2.98).

All 279 university students gave written consent to participate after being informed of the purpose of the study.

**Instruments**

Participants were administered the following paper and pencil tests.

**Single-Item Math Anxiety scale (SIMA)**. The SIMA consists of merely asking participants: "*On a scale from 1 to 10, how math anxious are you*?" The anchors for the scale were 1 (*not anxious*) and 10 (*very anxious*).

**Shortened Mathematics Anxiety Rating Scale (sMARS; Alexander & Martray, 1989)**. The sMARS is a 25-item version of the MARS (Richardson & Suinn, 1972). This instrument measures math anxiety. Twenty-five situations are presented to the examinee and the individual needs to rate his/her level of anxiety associated with each situation (i.e., each item). The rater responds to each item on a five-point Likert scale from 1 (*no anxiety*) to 5 (*high anxiety*). In the present study the Spanish version of the sMARS (Núñez-Peña, Suárez-Pellicioni, Guilera & Mercadé-Carranza, 2013) was used. The adaptation of this measure was carried out with 342 students from the University of Barcelona. The scores of the Spanish version of the sMARS have shown very strong internal consistency reliability (Cronbach's alpha = .94) and strong 7-week test-retest reliability (intra-class correlation coefficient = .72).

**Addition and Subtraction Verification Test from the French kit (French et al., 1963)**. This measure consists of a total of 60 two-operand additions and subtractions that have to be verified by saying whether a proposed result is correct or incorrect (e.g., 26 + 14 = 30). Subjects were asked to verify the results as quickly and as accurately as possible during a 2-minute period. They were informed of this time limit. The total score for the test was obtained by subtracting errors from correct responses.

**Simple-addition Test**. This test consists of 165 single-digit addition problems of the form $a + b =$. It was administered with a time limit of two minutes. The test comprised 24 different single-digit additions. No addition problems included the numbers 1 or 0 and tie problems (e.g., 4 + 4) were also excluded. The total score for the test was obtained by dividing the number of correct answers by the total number of operations answered by the subject.

**State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983).** The STAI is a scale used to measure state (STAI-S) and trait (STAI-T) anxiety. Strong to very strong internal consistency reliability estimates have been reported for the scores of the STAI scales (Cronbach´s alpha = .86 for STAI-S and .95 for STAI-T). Adequate 20-day test-retest reliability with college students have also been reported (State: $r$ =.76, Trait: $r$ =.86; Spielberger et al., 1983). The scale includes 40 statements describing different emotions: 20

for each scale. Items are answered on a four-point Likert scale. In the STAI-T, response options range from 0 (*almost never*) to 3 (*almost always*) and subjects have to respond by considering how they feel “in general”. In the case of the STAI-S, the response options range from 0 (*not at all*) to 3 (*very much*) and subjects answer on the basis of how they feel “right now”. In this study, the Spanish version of this test was used (Spielberger, Goursch & Lushene, 2008). The Spanish adaptation involved administering the Spanish version of the test to samples of university students (Bermúdez, 1977), replicating the obtained results with new samples of students and non-clinical adults, and finally validating the adapted measure with clinic groups (Urraca, 1981). The scores of the Spanish version of the STAI have demonstrated strong to very strong internal consistency for the scores of both scales (Cronbach’s alpha = .84-.87 for STAI-T and Cronbach’s alpha = .90-.93 for STAI-S). The 20-day test-retest reliability estimates with college students ranged from .76-.86 for the STAI-T scores and .27-.54 for the STAI-S scores.

***Primary Mental Abilities Test (PMA*; Thurstone, 1939*)***. The PMA includes five subtests, but only three of them were used in this study: Spatial Visualization (S factor), Reasoning (R factor), and Verbal Comprehension (V factor). The S factor measures the ability to mentally manipulate and visualize geometric relations. The R factor aims to measure the ability to find rules or principles in test items. Finally, the V subtest measures facility with words and vocabulary knowledge. The Spanish version of this test was used (Thurstone, 1987). The scores of the Spanish adaptation of the PMA have shown strong to very strong reliability: V factor: $r$ = .91 (split-half method); R factor: $r$ =.92 (split-half method) and E factor: $r$ = .73 (test-retest method). Regarding validity, the scores of the three subscales have shown significant correlations with the scores of other tests measuring the same ability, for example, moderate to high correlations were found between the V factor subscale and the DAT-Verbal (*r* = .61), the S factor and the Figure rotation test (*r* = .57) and the R factor and the DAT-Reasoning (*r* = .66).

**Three questions about attitudes towards mathematics**. The three questions about attitudes towards mathematics including enjoyment, motivation, and self-confidence were presented on a five-point Likert scale from 1 (*not at all*) to 5 (*very much*).

## Procedure

The researchers administered the questionnaires in regular classroom settings and supervised completion of the measures. The data were collected from March to April 2011 by a trained research group who took special care to avoid coercion or other biases regarding data collection.

## Data analysis

Descriptive statistics including the mean, standard deviation (*SD*), median (*Md*), observed range, and the 25$^{th}$ and 75$^{th}$ percentiles of the SIMA scores were computed.

Evidence supporting the validity of the SIMA scores as a measure of mathematics anxiety was examined by assessing the convergent and discriminant validity of the SIMA scores with the scores of other measures previously described by computing correlation coefficients (Pearson or Spearman, as appropriate). In order to assess the ability of the single-item measure to differentiate between groups, (gender and high-school itinerary), *t*-tests or ANOVA, with Bonferroni correction for multiple comparisons when appropriate were performed. Effect sizes for these analyses were also computed.

Following Wanous and Reicher (1996), the reliability of the SIMA scores was examined with an estimation of the minimum level of reliability by using the correction for attenuation formula coefficient when relating SIMA and sMARS scores ( $r_{xy} = \sqrt{r_{xx} \cdot r_{yy}}$ , where $r_{xy}$ = the observed correlation between variables $x$ and $y$, $r_{xx}$ = the reliability of variable x, and $r_{yy}$ = the reliability of variable $y$; Nunnally, 1978). In addition SIMA reliability was also estimated using a method based on factor analysis, because the communality of a single-item measure of math anxiety in a factor analysis with other math anxiety related items can be interpreted as a conservative estimate of single-item reliability (Harman, 1967). Accordingly, the scores of the SIMA and the 25 sMARS items were included in a factor analysis using principal axis factoring with (what rotation method did you use?) rotation procedure and the corresponding communalities were obtained. Test-retest reliability was evaluated with intra-class correlation coefficients (ICC) between the SIMA scores on the first and second test administrations with 82 of the 279 university students

**Results**

**Descriptive statistics**

The distribution of the SIMA scores was examined (see Figure 1). The mean score for the entire sample of 279 students was 5.18 (*SD* =2.43). The observed scores ranged from 1 to 10, the *median* was 5 and the 25$^{th}$ and 75$^{th}$ percentiles were 3 and 7, respectively.

INSERT FIGURE 1 ABOUT HERE

Floor and ceiling effects may appear when a high percentage of participants obtain the lowest level of math anxiety or the highest level of math anxiety possible score on the SIMA; this may raise doubts about the capacity of the SIMA to discriminate between low or high levels of anxiety, respectively. In the present study, the percentage of students who reported no anxiety (score of 1) was 5.7% (*n* = 16), while the percentage of those who reported high anxiety (score of 10) was 2.5% (*n* = 7). These results suggest that the item is variable enough because students score along the entire distribution of possible scores on the SIMA, avoiding restriction of range and ceiling or floor effects.

**Validity evidence**

Correlation coefficients between the SIMA scores and the scores of the other measures external to the test are reported in Table 2. The magnitude of these associations ranged from -.02 (with the PMA verbal scale) to .77 (with the sMARS). The overall pattern of correlations was in the expected direction. Specifically, results showed (a) a strong positive correlation between the math anxiety scores of the SIMA and the sMARS, r = .77; (b) a moderate negative correlation between the SIMA scores and the scores on the Addition and Subtraction Verification Test from the French kit, r = -.29; (c) a negligible relationship between the SIMA scores and the scores on the simple-addition test, r = -.11; (d) moderate positive correlations between the SIMA scores and the scores of the anxiety measures (STAI-S, *r* = .41 and STAI-T, *r* = .37); (e) negligible relationships between the SIMA scores and the PMA reasoning (r = -.20) and verbal abilities (r = -.02) scores; and (f) moderate negative correlations between the SIMA scores and the degree of mathematical enjoyment, motivation and self-confidence (r = -.57, -.53, and -.58, respectively).

INSERT TABLE 2 ABOUT HERE

The means and standard deviations for the SIMA scores based on gender and high-school itinerary are presented in Table 3. Women showed slightly higher levels of anxiety than men but the differences were not statistically significant ($t(277) = 0.778$; $p = .437$), with a negligible effect size (*d* = 0.11). In relation to the itinerary, the inter-groups effect was statistically significant ($F(4,236) = 12.259$; $p < .001$) and post-hoc comparisons with Bonferroni correction indicated that individuals who had taken the humanities itinerary had higher anxiety levels than those who had followed the scientific and technological itineraries. In addition, high anxiety levels were also found in individuals who followed the social science itinerary compared to those who followed the technological itinerary (see Table 3).

INSERT TABLE 3 ABOUT HERE

**Reliability**

As shown in Table 2, the correlation between the SIMA and the sMARS scores was $r = .77$, and the internal consistency of the sMARS, measured by Cronbach's alpha coefficient was .94. Thus, using Wanous and Reicher's (1996) approach, the reliability estimate for the SIMA could be derived by simply solving the formula presented above, and the value of .63 was obtained. This estimated reliability was marginally acceptable taking into account that this value represents the lower limit for this estimate assuming that the underlying construct correlation between the two measures is equal to 1. Relaxing this last assumption to .95, the minimum reliability estimate increased to .70, and if it was relaxed further to .90, the minimum reliability estimate increased to .78. The reliability of the SIMA was also estimated using factor analysis. The communality for the single-item score reached a value of .70, suggesting adequate reliability for the SIMA score, especially when compared to the average communality of .61 for the items on the sMARS.

With regard to the temporal stability of the scores on the SIMA, the participants were highly consistent across the two test administrations, separated by a 7-week interval.

Specifically, the ICC between the two test administrations was .81, suggesting that the scores on the SIMA showed adequate test-retest reliability.

## 1. Discussion

The purpose of the present study was to evaluate whether the SIMA scale is a useful tool to obtain valid and reliable scores of mathematical anxiety. Until now researchers and educators interested in studying mathematical anxiety have used time-consuming scales to measure participants' math anxiety level. This study was designed to provide an instrument that would be easier and quicker to administer. The results presented here provide strong support for the reliability and validity of the SIMA scores.

Our first finding was that SIMA scores were consistent with the sMARS scores, indicating that the SIMA scores assess mathematical anxiety. A correlation of .77 was found between the scores of these two scales, a result that closely matches those obtained in previous studies (Ashcraft, 2002; Ashcraft & Moore, 2009). Ashcraft was the first to ask participants this one-item question in his experiments, and reported correlations from .48 to .85 between the scores of the single-item measure and the sMARS scores.

The second group of findings in the present study was that SIMA scores correlated with the scores of other measures, as we had predicted, suggesting that the SIMA scores have good convergent and discriminant validity. As for the relationship between math anxiety and arithmetic achievement[2], we found that the SIMA scores were negatively related with performance on multi-digit problems — as math anxiety increases, arithmetic achievement declines — but were not related to performance on one-digit additions. These

[2] Overall, the sample showed a moderate level of math anxiety with a mean about 5.0, thus arithmetic performance may not be significantly impaired at this level.

results agree with previous studies (Ashcraft et al, 2000; Ashcraft & Faust, 1994; Faust et al., 1996) which have demonstrated that math anxiety effects on performance are especially notable in multi-digit problems but are minimal in single-digit additions and multiplications. Ashcraft and colleagues have explained this difference in the math anxiety effect on performance by claiming that math-anxious individuals consume working memory resources with intrusive thoughts and worry that makes it more difficult for them to solve multi-digit additions.

Regarding the relationship between math anxiety and other anxiety measures, we found that individuals with high scores on the SIMA also tend to score high on trait and state anxiety. However, the correlations were moderate (STAI-T = .41 and STAI-S =.37). It is worth noting the similarity between these correlations and those reported in Hembree's meta-analysis, where math anxiety correlated .42 and .38 with trait and state anxiety, respectively. These moderate correlations have been interpreted as evidence that math anxiety is similar to trait and state anxiety, although it is not the same construct (Dreger & Aiken, 1957).

As for PMA scales, negligible relationships were found between the SIMA scores and the scores of the reasoning, verbal, and spatial abilities scales. These results partially confirm our predictions. Although negligible relationships between math anxiety and reasoning and verbal abilities have been widely reported (see Hembree, 1990), a moderate negative relation between math anxiety and spatial ability is usually found. However, although in the present study the correlation between the SIMA scores and the scores of spatial ability failed to reach statistical significance, closer examination reveals that our correlation ($r = -.20$) was not so distant from the correlation reported in Hembree's meta-analysis ($r = -.29$). Moreover, even though this latter correlation differs significantly from

0, the relation between math anxiety and spatial ability accounts for only 8% of the variance (Rosenthal & Rosnow, 1984); so the relation between math anxiety and spatial ability needs further investigation.

As for the relationship between the SIMA scores and students' attitudes toward mathematics, the data confirmed our predictions. Correlations ranged from -.53 to -.58, indicating that the higher one's math anxiety, the lower one's degree of enjoyment, motivation and self-confidence in the subject. These negative relations provide support to what Ashcraft and Faust (1994) has called "global avoidance", the tendency of math-anxious individuals to avoid math courses and careers with high mathematical content. It seems obvious that individuals with more negative attitudes towards mathematics will avoid math-intensive education. We found similar results when we analyzed differences in the SIMA scores related to high-school itineraries: the highest math anxiety levels were related with the social science and humanities itineraries and the lowest levels were related with the science and technology pathways. The humanities students were the ones with the highest math anxiety. Although the present results showed the relationship between math anxiety and one's chosen career path, whether this is a causal or correlational issue remains unknown.

Furthermore, the findings of the present study indicated that the SIMA produces reliable scores. Although single-item scales have been criticized for not providing reliable measurements of relatively complex constructs (Loo, 2001; Loo & Kells, 1998; Wanous & Reichers, 1996; Wanous, Reichers & Hudy, 1997), in our view, the SIMA overcomes this criticism. Previous research recommended that single-item measures be considered only if the single item reflects a homogenous construct, as indicated by a high internal consistency reliability coefficient ($\alpha > 0.85$). Mathematics anxiety multiple-item tests have frequently demonstrated high internal consistency reliabilities. For example, Capraro, Capraro and Henson (2001) found that, across 28 studies, the MARS (Richardson & Suinn, 1972) yielded scores with a mean internal consistency reliability of .91, and Núñez-Peña et al. (2013) reported a Cronbach's alpha coefficient of .94 for the sMARS. In order to study the reliability of the SIMA scores, we also calculated reliability estimates by means of Wanous and Reicher's (1996) approach and factor analysis, and found that both methods provided reliability estimates suggesting that the reliability of the SIMA scores is adequate. Our data also demonstrated the SIMA scores had strong test score stability, at least over a 7-week test-retest reliability period.

Although the present study has shown that the SIMA scale is a useful tool to obtain valid and reliable scores of mathematical anxiety, there are two limitations that need to be acknowledged. The first one has to do with the extent to which the findings can be generalized, because this research was conducted with bachelor students majoring in psychology, with an over-representation of females. Although further research is needed to replicate the findings with different university student populations, it has to be noted that students majoring in psychology are considered representative of college students because they present variability in the areas they have concentrated in during their high school years. In our sample, 32.3% of students had graduated from high school with a concentration in social science, 22.9% in science and 20.4% in humanities. Technology was less represented (6.8%). The second limitation concerns the fact that there was smaller subsamples who completed the PMA and French kit tests (n = 58 and n =61, respectively), thus reducing the statistical power of correlations specially when trying to detect small effect sizes ($r < .20$). This was due to the fact that data were collected by means of accidental sampling in different lectures or lab sessions. It has to be noted, though, that the other measures (sMARS, STAI, etc.) were collected with subsamples of adequate size for the purposes of the present study.

Despite these limitations, the results of the present study offer initial support for the SIMA as a valuable assessment instrument of math anxiety. It can be especially useful for school psychologists and educators interested in measuring math anxiety in their students. The SIMA scale, as being only one item, can be administered in very little time, so it could help educators to detect students with high levels of math anxiety in large groups. Detecting math anxiety students in class is important for educators to adapt the teaching or evaluation systems for those students, with the aim of helping them to overcome their difficulties with mathematics.

**References**

Alexander, L., & Martray, C. (1989). The development of an abbreviated version of the Mathematics Anxiety Rating Scale. *Measurement and Evaluation in Counseling and Development, 22*, 143-150.

Ashcraft, M. H. (2002). Math anxiety: Personal, educational, and cognitive consequences. *Current Directions in Psychological Science, 11*(5), 181-185.

Ashcraft, M.H., & Faust, M.W. (1994). Mathematics anxiety and mental arithmetic performance: An exploratory investigation. *Cognition and Emotion, 8*, 97-125.

Ashcraft, M.H., Kirk, E.P., & Hopko, D. (2000). On the cognitive consequences of mathematics anxiety. In C. Donlan (Ed.), *The development of mathematical skills* (pp. 175-196). New York: Psychology Press.

Ashcraft, M.H., & Moore, A. M. (1999). Mathematics anxiety and the affective drop in performance. *Journal of Psychoeducational Assessment, 27*(3), 197-205.

Ashcraft, M. H., & Ridley, K. S. (2005). Math anxiety and its cognitive consequences: A tutorial review. In J.I.D. Campbell (Ed.), *Handbook of mathematical cognition* (pp. 315-327). New York: Psychology Press.

Ayalon, L., Goldfracht, M., & Bech, P. (2009). 'Do you think you suffer from depression?' Reevaluating the use of a single item question for the screening of depression in older primary care patients. *International Journal of Geriatric Psychiatry, 25,* 497-502.

Bermúdez Moreno, J. (1978). Ansiedad y rendimiento. *Revista de Psicología General y Aplicada, 151*, 183-207.

Capraro, M.M., Capraro, R.M., & Henson, R.K. (2001). Measurement error of scores on the mathematics anxiety rating scale across studies. *Educational and Psychological Measurement, 61*(3), 373-386.

Chochinov, H. M., Wilson, K. G., Enns, M., & Lander, S. (1997). Are you depressed? Screening for depression in the terminally ill. *American Journal of Psychiatry, 154,* 674-676.

de Boher, A. G. E. M., van Lanschot, J. J. B., Stalmeier, P. F. M., van Sandick, J. W., Hulscher, J. B. F., de Haes, J. C. J. M., & Sprangers, M.A.G. (2004). Is a single-item visual analogue scale as valid, reliable and responsive as multi-item scales in measuring quality of life? *Quality of Life Research, 13,* 311-320.

Dreger, R.M., & Aiken, L.R. (1957). The identification of number anxiety in a college population. *Journal of Educational Psychology, 48,* 344-351.

Faust, M.W., Ashcraft, M.H., & Fleck, D. E. (1996). Mathematics anxiety effects in simple and complex addition. *Mathematical Cognition, 2*(1), 25-62.

Fennema, E., & Sherman, J. (1976). Fennema-Sherman Mathematics Attitudes Scales. *JSAS Catalog of Selected Documents in Psychology, 6* (Ms. No. 1225).

French, J. W., Ekstrom, R. B., & Price, L. A. (1963). *Manual for kit of reference tests for cognitive factors*. Princeton, NJ: Educational Testing Service.

Gorsuch, R. L., & McFarland, S. G. (1972). Single vs. multiple-item scales for measuring religious values. *Journal for the Scientific Study of Religion, 11*(1), 53-64.

Gorsuch, R. L., & McPherson, S. E. (1989). Intrinsic/extrinsic measurement: I7E-revised and single-item scales. *Journal for the Scientific Study of Religion, 28*(3), 348-354.

Harman, H. H. (1967). *Modern factor analysis*. Chicago: University Chicago Press.

Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. *Journal for Research in Mathematics Education, 21,* 33-46.

Hopko, D. R., Mahadevan, R., Bare, R. L., & Hunt, M. A. (2003). The Abbreviated Math Anxiety Scale (AMAS): Construction, validity, and reliability. *Assessment, 10,* 178-182.

Hunt, T. E., Clark-Carter, D., & Sheffield, D. (2011). The development and part validation of a U.K. Scale for mathematics anxiety. *Journal of Psychoeducational Assessment, 29*(5), 455-466.

Hyde, J.S., Fennema, E., Ryan, M. Frost, L.A., & Hopp, C. (1990). Gender comparisons of mathematics attitudes and effect: A meta-analysis. *Psychology of Women Quarterly, 14*, 299-324.

Kellogg, D. R., Hopko, M. A., & Ashcraft, M. H. (1999). The effects of time pressure on arithmetic performance. *Journal of Anxiety Disorders, 13* (6), 591-600.

LeFevre, J.A., Kulak, A.G, & Heymans, S.L. (1992). Factors influencing the selection of university majors varying in mathematical content. *Canadian Journal of Behavioural Science, 24*(3), 276-289.

Loo, R. (2001). A caveat on using single-item versus multiple-item scales. *Journal for Mangerial Psychology, 17*(1), 68-75.

Loo, R. & Kells, P. (1998). A caveat on using single-item measures. *Employee Assistance Quarterly, 14*(2), 75-80.

Mahoney, J., Drinka, T.J., Abler, R., Gunterhunt, G., Matthews, C., Gravenstein, S., & Carnes, M. (1994). Screening for depression: Single question versus GDS. *Journal of the American Geriatrics Society, 42*(9), 1006-1008.

Maloney, E. A., Ansari, D., & Fugelsang, J. A. (2011). The effect of mathematics anxiety on the processing of numerical magnitude. *The Quarterly Journal of Experimental Psychology, 64* (1), 10-16.

Maloney, E. A., Risko, E. F., Ansari, D., & Fugelsang, J. A. (2010). Mathematics anxiety affects counting but not subitizing during visual enumeration. *Cognition, 114,* 293-297.

Nagy, M. S. (2002). Using a single-item approach to measure facet job satisfaction. *Journal of Occupational and Organizational Psychology, 75*, 77-86.

Núñez-Peña, M. I., Suárez-Pellicioni, M., Guilera, G., & Mercadé-Carranza, C. (2013). A Spanish version of the shortened Mathematics Rating Scale (sMARS). *Learning and Individual Differences*, *24,* 204-210.

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.

Plake, B. S., & Parker, C. S. (1982). The development and validation of a revised version of the Mathematics Anxiety Rating Scale. *Educational and Psychological.*

Richardson, F.C., & Suinn, R.M. (1972). The Mathematics Anxiety Rating Scale: Psychometric data. *Journal of Counseling Psychology, 19,* 551-554.

Rohland, B. M., Kruse, G. R., & Rohrer, J. E. (2004). Validation of a single-item measure of burnout against the Maslach Burnout Inventory among psysicians. *Stress and Health, 20,* 75-79.

Rosenthal, R., & Rosnow, R. L. (1984). *Essentials of behavioral research*. New York: McGraw-Hill.

Sandman, R. S. (1980). The mathematics attitude inventory: Instrument and user’s manual. *Journal for Research in Mathematics Education, 11,* 148-149.

Spielberger, C.D, Goursch, R.L., & Lushene, R.E. (2008). Cuestionario de ansiedad Estado-Rasgo, STAI. Madrid: TEA Ediciones.

Spielberger, C. D., Gorsuch, R., Lushene, R., Vagg, P. R., & Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press. Spanish adaptation of the STAI by TEA Ediciones S.A. (3rd Edition). Madrid, 1988.

Suinn, R. M., & Edwards, R. (1982). The measurement of mathematics anxiety: The mathematics anxiety rating scale for adolescents: MARS-A. *Journal of Clinical Psychology, 38*, 576-580.

Thurstone, L.L. (1939). *Manual of Instructions for the Primary Mental Abilities Test.* Washington, D.C.: American Council of Education. Spanish adaptation of the PMA by TEA Ediciones S.A. (8th Edition). Madrid, 1989.

Thurstone, L. L. (1987). Aptitudes mentales primarias (PMA). Madrid: TEA Ediciones.

Urraca Martínez, S. (1981). Actitudes ante la muerte (preocupación, ansiedad, temor) y religiosidad. Unpublished doctoral thesis. Faculty of Psychology, Universidad Complutense, Madrid.

Wanous, J. P., & Reichers, A. E. (1996). Estimating the reliability of a single-item measure. *Psychological Reports*, *78*, 631-634.

Wanous, J. P., Reichers, A. E., & Hudy, M. J. (1997). Overall job satisfaction: How good are single-item measures? *Journal of Applied Psychology, 82*(2), 247-252.

Yohannes, A. M., Dodd, M., Morris, J., & Webb, K. (2011). Reliability and validity of a single item measure of quality of life scale for adult patients with cystic fibrosis. *Health and Quality of Life Outcomes*, *9*, 105.

**FIGURE CAPTIONS**

Figure 1: The distribution of the SIMA scores (n=279).

Table 1... Subsample Descriptions and Measures collected

| | *n* (%) | | Mean age (SD, range) | | Measures | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Subsample | Women | Men | Women | Men | SIMA | sMARS | French kit | Simple-addition Test | STAI | PMA | Attitudes towards math |
| 1 | 14 (5.01%) | 7 (2.50%) | 21.64 (3.36, 19-30) | 21.29 (3.45, 19-28) | × | × | | × | × | × | × |
| 2 | 128 (45.87%) | 37 (13.26%) | 20.77 (3.36, 18-43) | 21.18 (2.34, 19-28) | × | × | | × | × | | × |
| 3 | 24 (8.60%) | 13 (4.65%) | 20.04 (2.05, 18-26) | 20.42 (3.70, 19-32) | × | × | × | × | × | × | × |
| 4 | 20 (7.16%) | 4 (1.43%) | 19.89 (1.94, 18-24) | 20.75 (.50, 20-21) | × | × | × | × | × | | × |
| 5 | 24 (8.60%) | 8 (2.86%) | 23.88 (8.11, 19-43) | 22.50 (3.00, 19-25) | × | × | | | | | |

Note. SIMA: Single-Item Math Anxiety; sMARS: Shortened Mathematics Anxiety Rating Scale; STAI: State-Trait Anxiety Inventory; PMA: Primary Mental Abilities Test

Table 2. Correlations between the SIMA Scores and the Scores of the Other Measures

| Measures | *n* | Correlation |
|---|---|---|
| sMARS | 279 | .77** |
| Verification test (French Kit) | 61 | -.29* |
| Simple-addition Test | 247 | -.11 |
| STAI-S | 245 | .41** |
| STAI-T | 245 | .37** |
| PMA-Spatial visualization | 58 | -.20 |
| PMA-Reasoning | 58 | -.20 |
| PMA-Verbal comprehension | 58 | -.02 |
| Enjoyment | 247 | -.57** |
| Motivation | 247 | -.53** |
| Self-confidence | 247 | -.58** |

Note. sMARS: Shortened Mathematics Anxiety Rating Scale; STAI: State (-S) –Trait (-T) Anxiety Inventory, PMA: Primary Mental Abilities Test

*p < .05, **p < .01

Table 3. SIMA Scores (Means and Standard Deviations) by Gender and High-School Itinerary

| Groups | *n* | Mean | *SD* | Comparison between groups |
|---|---|---|---|---|
| Sex | | | | $t(277) = .778$; $p = .437$ |
| Women | 210 | 5.25 | 2.47 | $d = .11$ |
| Men | 69 | 4.99 | 2.29 | |
| Itinerary | | | | $F(4,236) = 12.259$; $p < .001$ |
| Humanities | 57 | 6.33 | 2.21 | Humanities vs Social science: $p = .118$; $d = .44$ |
| | | | | Humanities vs Science: $p < .001$; $d = .74$ |
| | | | | Humanities vs Technology $p < .001$; $d = 1.86$ |
| | | | | Humanities vs Others: $p = 1.00$; $d = .39$ |
| Social science | 90 | 5.38 | 2.10 | Social science vs Science: $p = .288$; $d = .35$ |
| | | | | Social science vs Technology: $p < .001$; $d = 1.44$ |
| | | | | Social science vs Others: $p = 1.00$; $d = -.03$ |
| Science | 64 | 4.58 | 2.50 | Science vs Technology: $p = .004$; $d = .91$ |
| | | | | Science vs Others: $p = 1.00$; $d = -.35$ |
| Technology | 19 | 2.47 | 1.61 | Technology vs Others: $p = .005$; $d = -1.53$ |
| Others | 11 | 5.45 | 2.42 | |