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Investigation of Construct Validity of State Anxiety Inventory among Iranian 8th Grade Students

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ABSTRACT

This study is aimed to investigate construct validity of State Anxiety Inventory (SAI Y-1) among 8th grade Iranian students. Data from 680 lower secondary school students, (317 male and 363 female, in the age 14 years old) at Tehran and Shahriar City, the province of Tehran, Iran, who participated in the study was analysed. Principal component analysis was performed to determine underlying constructs among items on the S-Anxiety Inventory (SAI Y-1). The results of the study showed that three factors explained internal relations between the items. Safety factor states 21.87% with 7 items, tension factor states 14.5% with 4 items and confusion factor states 12.37% with 3 items.

Key words: State anxiety inventory, construct validity, iranian students

INTRODUCTION

Anxiety can be defined as an unpleasant emotional reaction to a threatening situation (Yan, 2006). According to The Free Dictionary (2010) the definition of anxiety in psychiatry is: "A state of apprehension, uncertainty and fear" from a person being confronted with a frightening event (either real or imaginary), which impedes his or her physical or psychological functions. Spielberger *et al.* (1970) meanwhile, stated that anxiety is a mental process involving stressors that evoke perceptions of threat, which culminate in an unpleasant emotional reaction. Spielberger *et al.* (1977) defined anxiety as an emotional state that simultaneously encompasses feeling tension, apprehension, nervousness and worry; in addition, he made a distinction between state anxiety, which is triggered by a stand-alone event and trait anxiety, which is longer-lasting.

Students have a great deal of anxiety, especially in study process. These are like difficulty of subjects and relationship problems, which increases the anxiety. Anxiety disorders are rising among students. High level of anxiety also interferes with concentration and memory, which are critical for academic success (Leta, 2001). Our previous study indicated that, male and female students are similar in their anxiety level (Sahranavard *et al.*, 2012a).

Meanwhile, Spielberger (1966) reported that anxiety can be a serious impediment to classroom functioning and achievement. Teachers involved in teaching these courses need to understand the role that anxiety plays in terms of students' achievement. In a study of mathematics anxiety, Eccles and Jacobs (1986) reported that mathematics anxiety appears to be an important predictor of mathematics grades and course-taking plans. It is also generally agreed upon that anxiety is comprised of two components, trait anxiety (T-anxiety) and state anxiety (S-anxiety).

Anxiety is a subjective state of internal discomfort. Dread and foreboding, which manifests itself in cognitive, behavioral and physiological symptoms. It is a normal emotion with adaptive value, in that it acts as a warning system to alert a person to impending danger (Cipriani-Sklar, 1996).

Anxiety often occurs without conscious or apparent stimulus, which distinguishes it from fear (Gurian and Miner, 1991). Cognitive symptoms of anxiety include worrying, impaired attention, poor concentration and memory problems. Physiological symptoms such as hyperventilation, sweating, diarrhea, trembling and restlessness also occur. Anxiety may be focused on a specific object, situation, or activity (a phobia) or may be unfocused and expressed as a more general dread. The five major types being: Panic disorder, obsessive-compulsive disorder, post-traumatic stress disorder, generalized anxiety disorder and phobias (ADAA., 2005).

Yan (2006) defined anxiety as an emotional reaction to a threatening situation, while Spielberger (1979) broke down this emotional reaction to subjective feelings of tension, apprehension, nervousness and worry.

Spielberger (1979) theory differs from traditional test-anxiety theories as it emphasizes the role of emotionality in test anxiety. State anxiety refers to the temporary state, the current feelings or conditions of an individual. It is conceptualized as transitory emotional state or condition of the human organism that is characterized by subjective, consciously perceived feelings of tension and apprehension and heightened autonomic nervous system. A state may vary intensely and fluctuate over time. State anxiety is defined as an unpleasant emotional arousal in face of threatening demands or dangers. A cognitive appraisal of threat is a prerequisite for the experience of this emotion (Lazarus, 1991).

A trait refers to relatively stable individual differences in anxiety proneness i.e., the difference between people in the tendency to respond to situations perceived as threatening with elevations in A-state anxiety. Trait anxiety thus reflects the existence of stable individual differences to respond with state anxiety in anticipation of threatening situations (Cipriani-Sklar, 1996).

Information about validity is necessary to determine whether variable in this study truly measures what it sets out to measure (Ary *et al.*, 2006). Validity, in the past, was defined as the ability of an instrument to actually measure what it is designed to measure (Nunnally and Bernstein, 1994) but in more recent usage, the term refers to how the data obtained from the instrument is interpreted (Ary *et al.*, 2002).

On the other hand, historically, validity was defined as the extent to which an instrument measured what it claimed to measure whereas the focus of recent views of validity is not on the instrument itself but on the interpretation and meaning of the scores derived from the instrument (Ary *et al.*, 2002). Validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. It is concerned with the study's success at measuring what the researchers set out to measure (Howie *et al.*, 2006). The notion of validity is very significant in current research; if part of a research is considered invalid, then it is worthless (Cohen *et al.*, 2000).

Construct validity is one of the most important concepts in all psychology that refers to the ability of a test to measure an intended hypothetical construct (Remenyi, 1998). In order to an instrument to have construct validity, the researcher has to ensure that the selected measuring instrument actually related to the ideas, concepts, relationships and issues being studied (Remenyi, 1998). Evidence bearing on the construct validity of the state scales was derived from a sample of 977 undergraduate students at Florida State University with a median *r* of 0.73 for females and 0.60 for males (Cipriani-Sklar, 1996). Additional validity data for the State-Trait

Anxiety Inventory (STAI) scales were obtained in a single testing situation of 197 undergraduate students under four different experimental conditions (normal, relax, exam, stressful movie) (Spielberger *et al.*, 1970). The correlations between S-Anxiety and T-Anxiety levels showed that persons who have a high level of T-Anxiety will have higher S-Anxiety, even in response to relatively neutral situations. This has an important implication in the construct validity of STAI, because correlations between both scales depend on the amount and kind of stress administered to measure S-Anxiety level (Spielberger *et al.*, 1970).

Therefore, based on these issues and the importance of anxiety in students' academic achievement, the study was conducted to investigate construct validity of State Anxiety Inventory (SAI Y-1) among Iranian eighth grades lower secondary school students.

MATERIALS AND METHODS

Sample: Six hundred and eighty Iranian eighth grades lower secondary school students in Tehran and Shahriar city, the province of Tehran, Iran (317 male and 363 female age 14 years) were recruited as participant in this study. They were recruited at random sampling and their participation was voluntary and anonymously done.

Procedure: Data was collected by means of structured questionnaire and by taking a class as a unit. Based on verbal agreements of the training lecturers and participants, the questionnaire forms were distributed to the 680 lower secondary school students. Participants were asked to complete the questionnaire simultaneously at the beginning of the core lecture and return them to their lecturer on the spot. All completed questionnaire were passed on to the researchers. All participants were informed that the participation was based on voluntary and anonymous.

Measures: All participants responded to an Iranian translation of the instrument in this study is State Anxiety Inventory (SAI Y-1).

The State Trait Anxiety Inventory STAI developed by Spielberger and Gorsuch (1970) contains self-report scales for measuring both state and trait anxiety and has been used extensively in research and clinical practice (Spielberger and Gorsuch, 1970). The present study deals to the state anxiety (Form Y-1) only. The S-Anxiety Inventory (SAI Form Y-1) used in this activity consists of twenty statements designed to evaluate how a respondent feels at that particular time. An important characteristic of the STAI is the ease and brevity of administration. It is designed to be self-administering and may be used for individuals or groups. The STAI Form Y is made up of 40 questions. The S-Anxiety Scales required the respondent to determine how he or she feels at a particular moment in time. The items are rated, on a four-point scale, according to the intensity of their feelings at that particular moment - (1) "not at all"; (2) "somewhat"; (3) "moderately so" and (4) "very much so". In addition, the State Anxiety scales as measured by 20 items on the S-Anxiety Inventory (SAI Form Y-1) developed by Spielberger and Gorsuch (1970).

The data for the present study 680 eighth grade lower secondary school students, (317 male and 363 female, in the age 14 years old) at Tehran and Shahriar City, a province of Tehran, Iran. For Iranian schools, eighth grade in lower secondary school is the final year before entering the high school. All the eighth grade students also sit for a national final examination; hence, understanding factor affecting their academic achievement is critical (Kabiri and Gharbi, 2009).

Data analysis: All items of S-Anxiety Scales were analyzed using principal components extraction factor analysis followed by a Varimax rotation procedure. The KMO and Bartlett's sphericity tests were used to test the hypothesis that the correlation matrix was an identity matrix and the

variables were independent. The results showed that chi-square values were significant at $p < 0.001$. Therefore, the hypothesis of the correlation matrix as an identity matrix was rejected. Authors have argued that KMO statistics values between 0.8 and 0.9 are high (George and Mallery, 2003; Field, 2005; Colman and Pulford, 2006). Thus, it was concluded that factor analysis was an appropriate procedure for analysing the variables. To determine the number of factors to be extracted, two conventional criteria, eigenvalue and scree test, were used. First, only factors with eigenvalues of 1 or greater were considered as independent factors and the result of the first criteria was examined with the scree-test. The scree plot confirmed the eigenvalues of 1 or greater for all factors considered to be independent, indicating consistency between the two criteria. As a result, variables with factor loadings of 0.40 or greater were considered to be criteria affecting multiple variables. The factors determined to be appropriate for extraction are based on the evidence in previous research (Bandura, 1982; Pajares, 1996; Baldwin *et al.*, 1999; DeWitz and Walsh, 2002; Schunk and Pajares, 2001).

Statistical analysis: To carry out the main objective of the present study, the obtained data was subjected to number of statistical analyses by using statistical package for social sciences (SPSS 18.0). Besides, descriptive statistics, Principal components extraction factor analysis and Reliability of S-Anxiety Inventory (SAI Form Y-1) for three factors were used in this study.

Descriptive statistics: Table 1 presents the mean and standard deviations of all the observed variables. Descriptive statistics is worked out to know the pattern of score distribution. A perusal of Table 1 reveals that the mean and standard deviation on State Anxiety Scales is 44.02 and 11.25, respectively (Table 1).

RESULTS

Principal component extraction: The initial results of principal components analysis have indicated that the amounts of eigenvalue of two factors are bigger than 1. In addition, from 20 items, five items (i.e., items of 9, 11, 13, 15 and 20) on two factors had cross load and the item of 17 did not have any loads on none of the factors. Therefore, these items have deleted. Then again analysis has done with 14 remaining items.

As shown in Table 2, the 14 items with factor loadings above 0.40 were identified and grouped according to three factors. Kaiser-Myer-Olkin statistic ($KMO = 0.89$) and Bartlett's test of sphericity (chi-square = 1916.19, $df = 91$, $p = 0.0001$) indicated that the correlation matrix was suitable for fact analysis, the number of factors was determined by both eigenvalues (>1) and the scree-test (Cattell and Scheier, 1963). Principal component analysis showed that there were 3 factors with an eigenvalue >1 . The eigenvalue of the first factor was 4.438 and it explained 31.7% of the variance and the eigenvalues and the percentages of variance explained by the second and the third factor were 1.365 and 9.75% and 1.023 and 7.31%, respectively. As such, the total variance

Table 1: Descriptive statistics of the independent and dependent variables

State anxiety	Values
No.	680.00
Minimum	20.00
Maximum	80.00
Mean	44.02
Std deviation	11.25

Table 2: Extracted factors with the survey items and their factor loadings

Factors and items	Iranian factor loadings
Safety	
I feel secure	0.732
I feel at ease	0.706
I feel calm	0.662
I feel satisfied	0.651
I feel comfortable	0.642
I feel content	0.577
I feel steady	0.462
Tension	
I am tense	0.723
I feel upset	0.679
I feel nervous	0.657
I feel strained	0.512
Confusion	
I feel indecisive	0.772
I feel confused	0.711
I am presently worrying over possible misfortunes	0.431

Table 3: Variance in Iranian students accounted for by each factor

Factors	Initial eigenvalues			Rotation sums of squared loadings	
	Total	Variance (%)	Cumulative (%)	Variance (%)	Cumulative (%)
Safety	4.438	31.703	31.703	3.063	21.877
Tension	1.365	9.750	41.453	2.031	14.507
Confusion	1.023	7.310	48.762	1.733	12.379

explained by the 3-factor structure of the Inventory was 48.76%. The eigenvalues and loadings of the items are shown in the Table 2; loadings ranged between 0.43 and 0.70. Table 3 shows percentage of the variance explained by each factor and the total variance explained by all factors. These factors were called to as safety, tension and confuse, respectively.

Reliability of State Anxiety Inventory (SAI) for three factors: The reliability of state anxiety inventory (SAI Form Y-1) was demonstrated after Principal components analysis. The Cronbach's coefficient alpha for safety factor was 0.78. Thus, the Cronbach's alpha coefficient safety factor was greater than 0.70, the 7 items were considered reliable (McMillan and Schumacher, 1993; Hair *et al.*, 1998) and this suggests that it is capable of measuring students' State Anxiety Scales.

The Cronbach's coefficient alpha for tension factor was 0.66, for confusion factor was 0.51. According to Nunnally and Bernstein (1994) index acceptable level this index computed was not at this acceptable level. However, Ary *et al.* (2002) pointed out that a lower reliability coefficient (in the range of 0.50-0.60) might be acceptable if the measurement results use in making a decision about a group or even for research purposes. Further, Worthen *et al.* (1999) also agreed to Ary *et al.* (2002), they expressed reliability coefficient as low as 0.50 was acceptable if the test was to be used on making decision about a group. Thus, the Cronbach's alpha coefficient of tension and confusion factors of State Anxiety Scales were greater than 0.50, the items of instrument were considered reliable and this suggests that it is capable of measuring students' state anxiety scale (Table 4).

Table 4: Reliability analysis of state anxiety inventory (SAI form Y-1)

Factor	No.	No. of items	Cronbach's alpha
Safety	680	7	0.786
Tension	680	4	0.661
Confusion	680	3	0.516

DISCUSSION

This study was designed to investigate construct validity of S-Anxiety Inventory (SAI Form Y-1) among 8th grade Iranian students. Factor analysis showed these three factors explained the highest proportion of the variance among 14 items.

In the construction of the STAI, individual items were required to meet prescribed state and trait validity criteria at each stage of the process of the development of the test. Evidence bearing on the construct validity of the state scales was derived from a sample of 977 undergraduate students at Florida State University with a median r of 0.73 for females and 0.60 for males (Wilkerson, 1980). Additional validity data for the STAI scales were obtained in a single testing situation of 197 undergraduate students under four different experimental conditions (normal, relax, exam, stressful movie) (Spielberger *et al.*, 1970). Spielberger *et al.* (1970) state that for S-Anxiety scale, on the other hand, the stability coefficients ranged from 0.16-0.62, which are relatively low figures because a valid measure of State Anxiety Scales should reflect the influence of unique situational factors that may exist at the time of testing. According to the developer, given the transitory nature of anxiety states, measures of internal consistency such as the alpha coefficient, provide a more significant index of the reliability of the S-Anxiety scale than test-retest correlations. Alpha coefficients for the Form (Y-1) S-Anxiety scale, computed by Formula KR-20 as modified by Spielberger *et al.* (1970), showed median coefficients of 0.93 and for Stability, when as measured by test-retest coefficients is thus relatively low for the S-Anxiety scale, as is expected for a measure assessing changes in anxiety. In addition, when measured by alpha coefficients and item-remainder correlations, the internal consistency of S-Anxiety is quite high (Spielberger *et al.*, 1970). The alphas reported were for males and females respectively, 0.89, 0.91, 0.89 and 0.83. Correlations were moderately high (Spielberger and Gorsuch, 1970). There is a large body of evidence documenting the reliability and validity of the STAI (Katkin, 1978). The reported one-hour test-retest reliability coefficients for the STAI-S are 0.33 for males and 0.16 for females and the 20-day STAI-S test-retest coefficients are 0.54 for males and 0.27 for females (Dreger, 1978). Relatively low test-retest reliability coefficients are expected for the STAI-S because a valid measure of State Anxiety Scales should reflect the unique situation at the time of testing (Spielberger *et al.*, 1970). Measurements of internal consistency for the STAI-S range from alpha coefficients of 0.83-0.92 (Dreger, 1978). Caldwell (1988) obtained an alpha coefficient of 0.94 for the STAI-S scores (Dreger, 1978; Katkin, 1978). Sahranavard *et al.* (2012b) said there is no significant difference between urban, suburban and rural students in State Anxiety Scales.

In the present study the reliability of the Iranian form of the inventory (Cronbach's $\alpha = 0.88$), the reliability for Safety factor was 0.78 and for Tension factor was 0.66, for confusion factor was 0.51.

Based on principal component analysis, with cut off point factor loading >0.40 , three factors were identified. With eigenvalue <1 , the identified component explained 48.76% of the total variance. The identified component labeled as Safety consisted seven items. It then followed by a component labeled as Tension consisted of four items and the last component is labeled as confusion consisted of three items.

A major strength of the present study is the inventory, which facilitates the assessment of belief in state anxiety as one of the basic concepts of Counseling Psychology, can be used in many domains related to human behavior, such as education, healthcare, social life and in particular, psychiatry and psychology.

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