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Re-test of State Trait Anxiety Inventory (STAI) among Engineering Students in Malaysia: Reliability and Validity tests

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Abstract

Various tests have been conducted using the State Trait Anxiety Inventory (STAI) and it has provided adequate evidence to measure anxiety in research and clinical settings. This paper proposes a re-test to evaluate STAI among engineering students in Malaysia. A total 253 engineering students participated in this study. The re-test was presented for reliability, construct validity, and coefficient correlation of State and Trait. The reliability coefficients were computed using Cronbach alpha. In order to determine the validity of the instrument used factor analysis and coefficient correlation were used. Results: The STAI was established with the reliability at .850. In addition, the construct validity of the STAI, as measured by factor analysis were found, the correlation between items (KMO) score .824 ($>.30$) and $p=.000$. Where, the State shows KMO=.818, $p=.000$, and Cronbach alpha found .797. Meanwhile, Trait proved KMO=.783, $p=.000$, and Cronbach alpha found .781. The results show that the reliability and validity of State Trait Anxiety Inventory was suitable and acceptable. Consistently, strong correlations between State and Trait scale scores provided supportive evidence for the instrument. The results are evident and it can be recommended as an instrument to measure anxiety level for similar studies.

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Keywords: Reliability; Validity; State; Trait; STAI; Anxiety; Engineering students.

1. Introduction

Anxiety is an emotional state consisting of feeling tensed, apprehension, and nervousness (Spielberger *et al.*, 1983). Anxiety attacks are very real to the person, having one can even paralyze someone from doing even the simplest of daily tasks. All of anxiety disorders are defined by the dual characteristic of physiological hyper arousal and excessive emotional fear. Anxiety sensitivity is the fear of anxiety related sensation such as increased heart rate and breathlessness (Stewart *et al.*, 1999). It has been found that a certain level of anxiety can become a facilitative tool for an individual to perform effectively. The combination of feeling and anxiety can interfere with performance by blocking the utilization, attention resources, or more cognitive interference from the worries and fears induced by

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anxiety. Anxiety is an occurrence that human beings normally encounter within their daily experiences. It is considered to be one of the most widespread and persistent human emotions, with affected physiological arousal and cognitive functions. In addition to being subjectively unpleasant, anxiety has its overheads in contend for bodily (physiology) and cognitive resources (Kalisch *et al.*, 2005).

These can be differentiated into state anxiety and trait anxiety. State anxiety is a transitory emotional condition reflective of one's interpretation of a particular stressful situation at a particular period of time or feeling at a particular moment in time. Trait anxiety is the enduring of personality characteristic that refers to relatively stabilising individual differences that characterizes people's anxiety or general feeling of anxiety (Spielberger *et al.*, 1983). The 40 items for self evaluation questionnaire includes separate form of state (STAI form Y-1) and trait (STAI form Y-2), anxiety each having 20 items. In 1964th, the original STAI form was constructed by Charles D. Spielberger, Richard L. Gorsuch, and Robert E. Lushene (Spielberger, 1972). The STAI has been translated into more than 60 languages and has been used in thousands of studies designed to evaluate anxiety studies and medical disorders, as well in treatment of anxiety among students (Spielbereger *et al.*, 2004). In similar studies, STAI scores was found to reduce anxiety significantly among students, and this was reduced after treatment (Vitasari *et al.*, 2010).

This paper describes on a re-test of the STAI. A total 300 engineering students participated in this test during first semester. Re-test was presented for reliability, construct validity, and coefficient correlation of State and Trait. The reliability coefficients were computed in Cronbach alpha. In order to validate the instrument factor analysis was used, and coefficient correlation was acceptable. The STAI was established with the reliability readings of 850. In addition, the construct validity of the STAI, as measured by factor analysis found the correlation between items (KMO) score .824 ($>.30$) and $p=.000$. Where, the State shows KMO=.818, $p=.000$, and Cronbach alpha found .797. Where, Trait proved KMO=.783, $p=.000$, and Cronbach alpha found .781. The results showed that the reliability and validity of State Trait Anxiety Inventory was suitable and acceptable for engineering students. Respectively strong correlations between State and Trait scale scores provided supportive evidence for the instrument. That was recommended as an instrument to measure anxiety level for similar studies.

The rest of this paper was discusses on description of the STAI in section 2. Section 3 describes the method. Section 4 describes result and discussion. Finally, the conclusion of this work is presented in section 5.

2. State Trait Anxiety Inventory

The discussion of State Trait Anxiety Inventory is explained with the description of the STAI and also the prior studies of STAI.

2.1. Description of the STAI

The STAI consists for a 40 items self evaluation questionnaire which includes separate measures of state and trait anxiety. This instrument used all original items with no modification whatsoever. The State-Anxiety scale (STAI Form Y-1) consists of twenty statements that evaluate how respondents' feel about anxiety "right now, at this moment" through four scales: one (not at all), two (somewhat), three (moderately so), and four (very much so). The Trait-anxiety scale consists of twenty statements that assess how people "generally feel" about anxiety with four scales: one (almost never), two (sometimes), three (often), and four (almost always). A rating of four indicates the presence of a high level anxiety and one indicates the absence of a high level anxiety (Spielberger *et al.*, 1983). The anxiety level was found by calculation of scores, The range of scores is from 20-80, the higher the score indicating greater anxiety (Spielberger *et al.*, 1983).

2.2. Prior studies of STAI

A number of reliability and validity tests have been conducted on the STAI and have provided sufficient evidence that the STAI is an appropriate for anxiety studies in research and clinical settings (Spielberger *et al.*, 1983). The scale of the reliability coefficients decreases at a function of interval length. For the Trait-anxiety scale the coefficients ranged from .65 to .86, whereas the range for the State-anxiety scale was .16 to .62 (Spileberger, 1972). This low level of stability for the State-anxiety scale is expected since responses to the items on this scale are

thought to reflect the influence of whatever transient situational factors exist at the time of testing (Spielberger, 1972). The lower order subscales created from this factor solution were examined in a sample of individuals diagnosed with an anxiety disorder. Generally, the results determined supports that this STAI instrument is the right instrument to assess anxiety. One set of items appeared to assess anxiety and worries, whereas the other assessed sadness and self-deprecation (Spielberger, 1972). The two subscales correlated differentially with other measures of anxiety and depression in a manner that was consistent with their content (Bieling *et al.*, 1998). The instrument is divided into two forms, each having twenty questions. The number on the scale is positively correlated to anxiety related to the question (Tilton, 2008).

3. Method

The paper describes a re-test of State Trait Anxiety Inventory among engineering students that aimed to determine reliability score, validity of instrument, and coefficient correlation of state and Trait. The Method in this paper includes respondents' information, procedures of the test, and analysis of the data, these are explained as follows.

3.1. Respondents

The stability of the STAI scales was assessed on male and female samples of engineering students in the University Malaysia Pahang. 253 of engineering students were assigned randomly to complete the questionnaire. For demographic information questions were on the following: gender, age, faculty, year of studies, and race.

3.2. Procedures

The test was conducted during first semester in 2008/2009. The students first listened to the instruction to fill the questionnaires, and if they did not understand any question, the researcher was at hand to explain the question. The STAI has 40 questions and were supposed to take approximately 15 minutes to complete.

3.3. Data analysis

The quantitative method was used to find the reliability, validity, and the coefficient correlation between state and trait. Factor analysis and Pearson correlation were used to analyze the data. The statistical analysis was analysed on SPSS 16.00 statistical software.

4. Results and Discussion

The test was conducted randomly in five engineering faculties at Universiti Malaysia Pahang. The results showed demographic profile of participants, reliability and validity test of STAI, and correlation between state and trait. These explained as follows.

4.1. Demographic profile of respondents

Respondents were asked about their gender, age, faculty, year of studies, and race for demographic information. The respondents were 109 male and 144 female students with an average age ranging from 18 to 26 years old, from five engineering faculties and most of them were ethnic Malays (62%).

4.2. Reliability and validity test of STAI

Nunnally (1978), recommended that the instruments used in basic research must have a reliability of Cronbach Alpha score .70. The reliability of STAI for engineering students consists of .850. Factor analysis was used to test the validity of the questionnaire. Test Validity interpretation of the correlation between items (KMO score) according to Sekaran (2003) must be $\geq .30$, and Bartlett's test of sphericity must be significant. All items shows KMO = .824 ($>.30$), Bartlett's test of sphericity = .000 ($p=.000$). Table 1 presented the reliability and validity of STAI.

Table 1 Reliability and validity of STAI

Items	Cronbach alpha	KMO	Bartlett's test of sphericity
STAI (N=253, 40 items)	.850	.824	.000

For component and communality of forms, State found .797 for reliability score, with KMO yielding .783 ($>.30$) and Bartlett's test of sphericity = .000 ($p=.000$). Intended for Trait with reliability score .781, KMO =.783 ($>.30$) and Bartlett's test of sphericity = .000 ($p=.000$), respectively. Table 2 and 3 displays the component and communality of each item. Table 4 presented on the reliability and validity of State and Trait. Accordingly of the results, it was not necessary to change the items.

Table 2. Component and communality of State (20 items)

Items	Mean	Stand. deviation	Component	Communality
Q1	2.07	.726	.562	.574
Q2	2.06	.670	.508	.578
Q3	2.28	.843	.588	.599
Q4	2.17	.816	.510	.556
Q5	2.31	.827	.303	.415
Q6	2.00	.898	.636	.541
Q7	2.37	.870	.527	.393
Q8	2.47	.819	.471	.604
Q9	2.21	2.084	.215	.792
Q10	2.08	.810	.476	.500
Q11	2.17	.755	.552	.451
Q12	2.21	.842	.523	.424
Q13	2.06	.737	.566	.517
Q14	2.13	.754	.411	.508
Q15	2.06	.774	.593	.480
Q16	2.22	.774	.382	.477
Q17	2.19	.849	.575	.454
Q18	2.53	.932	-.028	.590
Q19	2.47	.829	.013	.583
Q20	2.28	.808	.486	.609

Table 3. Component and communality of Trait (20 items)

Items	Mean	Stand. deviation	Component	Communality
Q21	2.36	.798	.415	.656
Q22	2.25	.722	.436	.537
Q23	2.38	.801	.517	.610
Q24	2.70	1.034	.140	.644
Q25	2.15	.863	.626	.576
Q26	2.39	.777	.426	.691
Q27	2.41	.843	.602	.590
Q28	2.21	.831	.537	.606
Q29	2.18	.903	.491	.549
Q30	2.17	.896	.575	.648
Q31	2.38	.835	.592	.568
Q32	2.24	.860	.462	.545
Q33	2.30	.770	.432	.537
Q34	2.46	.799	.260	.447
Q35	2.36	.777	.394	.442
Q36	2.41	.743	.380	.563
Q37	2.54	.799	.222	.505
Q38	2.40	.883	.419	.703
Q39	2.23	.800	.552	.515
Q40	2.37	.763	.549	.505

Table 4. Reliability and validity of State and Trait

Items	Cronbach alpha	KMO	Bartlett's test of sphericity
State (20 items)	.797	.818	.000
Trait (20 items)	.781	.783	.000

4.3. Correlation of State and Trait

Pearson correlations had determined the coefficient correlation and significant correlation of State and Trait among engineering students. The results showed significant correlation with $p=.000$ ($p<.05$) and large coefficient correlation yield $r=.621$. Descriptive statistics examined the mean and standard deviation which states ($M=44.24$, $SD=7.402$) and Trait ($M=46.90$, $SD=7.525$). Table 6 displays the results.

Table 6. Correlation of State and Trait

Forms	Mean	Stand. deviation	Coefficient correlation (r)	Significant correlation (p)
State	44.24	7.402		
Trait	46.90	7.252		
State~Trait			.621	.000

The findings is consistent with the with theoretical support for the construct of anxiety and this was demonstrated by high correlations between A-State and A-Trait scales in the subsamples (Novy *et al.*, 1993).

5. Conclusion

Anxiety is considered to be one of the most widespread and persistent human emotions, an occurrence that human beings normally encounter within their daily experiences. These can be differentiated into state anxiety and trait anxiety. A number of reliability and validity tests have been conducted on the STAI and have provided sufficient evidence that the STAI is an appropriate instrument to measure anxiety in research and clinical settings. The reliability coefficients yielded .850. Factor analysis were used in order to determine the validity of the STAI with $KMO = .824$ ($>.30$), Bartlett's test of sphericity = .000 ($p=.000$), and coefficient correlation found large number with $r=.621$. In addition, the construct validity of the State and Trait, as measured by factor analysis were found to have a correlation between items (KMO) score .824 ($>.30$) and $p=.000$. Where, the State shows $KMO=.818$, $p=.000$, and Cronbach alpha found .797. Consistently, Trait proved $KMO=.783$, $p=.000$, and Cronbach alpha found .781. Finally strong correlations between State and Trait scale scores provided supportive evidence for convergent validity among the students. The results showed that the reliability and validity of State Trait Anxiety Inventory was suitable and acceptable. Hence, STAI is recommended to measure anxiety level for similar studies.

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