Establishing the Construct Validity and Reliability of an Urdu Translation of the Test Anxiety Inventory

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The aim of this study was to explore the psychometric properties of an Urdu translation of the Test Anxiety Inventory (U-TAI) and replicate findings ongender differences and relations with performance. A sample of 1885 secondary school students from the Punjab province of Pakistan completed the U-TAI approximately three months before taking the Secondary School Certificate examinations (examinations in Pakistan required to leave Secondary School) and data collected for performance in math and science subjects. A two-factor structure consisting of worry and emotionality components of test anxiety showed acceptable construct validity and internal reliability. Female students reported higher emotionality scores, and inverse relations with performance were stronger for the worry component. The U-TAI has showed sufficient validity and reliability to be used in subsequent research with Urdu speaking people.

Keywords: Construct Validity, Reliability, Test Anxiety Inventory (TAI)

Ullah, Richardson and Hafeez (2011) noted the paucity of research into the experiences of university students in Pakistan. This research has inadvertently discovered that the same applies to students at school level in Pakistan. One of the main barriers to facilitate work into experiences of students of all ages in Pakistan is the lack of measures typically found in contemporary psycho-educational research (self-efficacy, achievement goals, self-concept, assessment-related emotions, and so forth) which have been translated into Urdu, the main language spoken in Pakistan, or one of the other regional dialects. Although cultural variations in the definitions and experience of emotions may exist, anxiety remains one of the basic universal markers of psychological well-being (Spielberger, 2006)

Defining the Test Anxiety Construct

Test anxiety is defined as a situational-specific anxiety trait in which individuals have a greater or lesser tendency to appraise performance-evaluative situations as threatening (Spielberger & Vagg, 1995). Transactional process models of test anxiety (Loweet et al., 2008; Zeidner & Mathews, 2005) position trait test anxiety as one of several possible personal (e.g., competence beliefs) and situational (e.g., importance of test) antecedents which may combine to determine the actual degree of (state) anxiety experienced in a specific performance-evaluative situation. Test anxiety has usually been investigated in an educational context, concerning the tests, examinations and other assessments taken by students in school, college and universities (Putwain, 2008a). In principle, test anxiety could, however, apply to any situation in which one's performance is judged or evaluated by others (e.g., a driving test) although examples in the literature are relatively rare (Fairclough, Tattersall,& Houston, 2006).

The Multidimensionality of Test Anxiety

Test anxiety has long been considered as multidimensional and a fundamental distinction is made between the cognitive and affective-physiological components of anxiety (Spielberger, Gonzalez, Taylor, Algaze,& Anton, 1978). The cognitive component, typically labelled as worry, represents thoughts and other self-depreciating statements regarding failure and the consequences of failure (e.g., not attaining cherished goals, being judged negatively by others and so forth). The affective-physiological dimension, usually labelled as emotionality, represents the person's perception of their autonomic arousal. The worry/emotionality distinction has proved extremely robust and has also been replicated in many studies (Benson, Moulin-Julian, Schwarzer, Seipp,& El-Zahhar, 1992). Although this distinction has been elaborated on in subsequent work (Benson et al., 1992; Sarason, 1984) and other components of test anxiety have been proposed (Friedman & Bendas-Jacob, 1997; Lowe et al., 2008), the distinction between cognitive and affective-physiological components remains central to the test anxiety construct definition and domain.

Although worry and emotionality are related, one of the ways in which the distinction is useful, both theoretically and substantively, is in relations with educational performance or achievement. A robust and well replicated finding is that small inverse relations are reported between educational performance and test anxiety, which tend to be larger for the worry component than for the emotionality component (Chapell et al., 2005; Hembree, 1988; Seip, 1991). Explanations usually focus on the role played by worry cognitions in occupying working memory resources, making it difficult to organise one's thought and recall material which has been previously learned, particularly when examination or test questions require the student to conduct several sequential steps and hold the answer to one step in mind, all while thinking about the next step (Derakshan & Eysenck, 2009; Owens, Stevenson, Norgate,& Hadwin, 2008).

One other notable and well-replicated finding regarding the different components of test anxiety is that female students report higher scores on the emotionality component whereas gender differences on the worry component are either smaller or not present (Zeidner, 1990; Zeidner & Nevo, 1992; Zeidner & Schleyer, 1999). Explanations focus on presentation bias and socialization processes although there has been no convincing evidence for either. Gender differences do not, however, appear to moderate the test anxiety and educational performance relationship (Putwain, 2008b).

Although test anxiety has been investigated in many different counties (Seipp & Schwarzer, 1996) and measures such as the Test Anxiety Inventory (TAI) have been translated into many different languages (O'Neil & Fukumura, 1992), sometimes for use in cross-cultural studies and sometimes for use in host cultures, there has been no other measures to-date available for use in Pakistan. To facilitate future work into test anxiety using samples of Pakistani students, we report work in which we have translated the most well-known measure of test anxiety with arguably the most widespread use, the TAI, into Urdu and checked the psychometric features of this measure via its construct validity, reliability and discriminative validity.

Aim of the Study

The aim of this study was to translate the TAI into Urdu and then check the properties of this measure to establish its reliability and validity for use in future research. First, the factorial validity and internal reliability of the translated TAI was examined, expecting that the two-factor structure of worry and emotionality components would be demonstrated in a Pakistani sample of students with acceptable internal reliability. Second, the gender differences (including factorial invariance across male and female students) were measured, expecting to find female students reporting higher emotionality scores and no (or smaller) gender differences in worry scores. Last, the correlations between test anxiety and examination performance was examined, expecting to find inverse relations, which were stronger for the worry component than the emotionality component (a test of discriminative validity). Although these theoretical predictions are replications of existing research, the research described here offers an extension to the extant literature by establishing the reliability and validity of the TAI in a new culture; an important step in preliminary research.

Method

Participants

Data was collected from 1885 secondary school students drawn from sixty-four schools located in four districts from the Punjab province of Pakistan. The sample was stratified so that data was collected from equal numbers of schools in urban (n = 1197) and rural (n = 688) locations, single sex girls' (n = 887) and

boys' schools (*n* = 998) in each of the four districts in Punjab province. Participants were in the 10th grade of school (the final year of compulsory education in Pakistan), aged 15-16 years in which students take public Secondary School Certificate (SSC) examinations in math, physics, chemistry and biology.

Measure

Test anxiety was measured using an Urdu translation of the Test Anxiety Inventory (U-TAI: Spielberger, 1980). Although more recent measures are available, this classic measure was selected for several reasons: (1) it is the most widely used measure of test anxiety (Benson et al., 1992) in which factorial validity has been demonstrated in versions translated for use in other cultures (Benson et al., 1992; Seipp & Schwarzer, 1996), (2) other measures all incorporate the fundamental distinction between cognitive and affective-physiological components which are included on the TAI, (3) there is no consensus in the literature over which additional components of test anxiety should be included in the construct (cf. Lowe et al., 2008) and equivocal findings regarding additional components (cf. Putwain, Connors,& Symes, 2010). The TAI would therefore seem an appropriate measure with which to start preliminary research. The TAI consists of twenty statements regarding the worries and anxieties that students experience in tests and examinations. Students respond on a scale of 1 = almost never, 4 = almost always. Eight statements correspond to the worry subscale (e.g., 'Thoughts of doing poorly interfere with my concentration in tests'), while another eight focus on emotionality (e.g., 'I feel very jittery when taking an important test') scale, with the remaining four statements included in a total TAI score. Measures of educational performance were taken from board certified SSC examination results in math, physics, chemistry and biology.

Procedure

The TAI was independently translated and back-translated from English to Urdu. The researcher as part of an on-going project collected data about test anxiety in Pakistan in the usual classroom environment, approximately three months before students appeared in their SSC examinations. Also, prior to data collection, the aims of the project were explained to students.

Results

Factorial Validity of the U-TAI

Using confirmatory factor analyses, five different models of the U-TAI were tested: (1) a unidimensional model, (2) a model based on the original TAI with eight items loading separately on each of the worry and emotionality components as first-order factors and covariance specified between worry and emotionality, (3) an alternative model also based on the original TAI with eight

items loading separately on each of the worry and emotionality components as first-order factors, four items loading on both factors and covariance specified between worry and emotionality, (4) a model which specified worry and emotionality as lower order factors and test anxiety as a higher order factor, based on model 2 with covariance removed, and (5) a model which specified worry and emotionality as lower order factors and test anxiety as a higher order factor, based on model 3 with covariance removed. In line with recommendations for assessing model fit (Marsh, Hau,& Wen, 1999; Marsh, Hau,& Grayson, 2005), used several criteria including the χ^2 statistic, Root Mean Square Error Approximation (RMSEA), Confirmatory Fit Index (CFI) and Tucker-Lewis Index (TLI). RMSEA values of ≤.05 and CFI/TLI values of ≥.95 are considered as evidence of a good fitting model and RMSEA values of ≤.08 and CFI/TLI values of ≥.90 are considered as evidence of a reasonable fitting model. Confirmatory factor analyses are reported here in Table 1.

Table 1
Confirmatory Factor Analysis

Model	x2	df	RMSEA	CFI	TFI
Model 1: Unidimensional	1128.35***	170	.055	.880	.866
Model 2: 16-item first order	473.92***	103	.046	.949	.940
Model 3: 20-item first order	737.75***	165	.043	.928	.918
Model 4: 16-item higher order	473.92***	103	.046	.949	.940
Model 5: 20-item higher order	737.75***	165	.043	.928	.918

The analyses reported in Table 1 indicate that models 2 and 4 offered the best fit, but there was no particular advantage to a model with a higher order factor (model 4) of general test anxiety that comprised only of two lower level factors (model 2), worry and emotionality, which covaried. Therefore model 2 was accepted. Factor loadings are reported in Table 2.

Factorial Invariance for Male and Female Subsamples

To establish whether this factor structure was equivalent for male and female students, this model separately tested for each subsample. Confirmatory factor analyses are reported in Table 3, which suggested a good to reasonable fit for both male and female students when tested separately.I then proceeded to test a configurable model in which the factor structure is fitted to both groups simultaneously. The reasonable model fit here indicates that items are indicators of the same factors in both males and female subsamples. I then tested a model in which factor loadings were constrained to be equivalent across both groups (metric invariance) was then tested.

Table 2
Factor loadings and reliability coefficients for the whole model and for gender subsamples

	Total Sample		Female subsample		Male subsample	
	W	E	W	E	W	E
3. Thinking about my grade in a course interferes with my work on tests	.55		.49		.65	
4. I freeze up on important exams	.46		.56		.44	
5. During exams I find myself thinking about whether I'll ever get through school	.13		.12		.18	
6. The harder I work at a test, the more confused I get	.90		.73		.89	
7. Thoughts of doing poorly interfere with my concentration of tests	.39		.42		.43	
14. I seem to defeat myself while working on important tests	.68		.63		.75	
17. During tests I find myself thinking about the consequences of failing	.53		.55		.58	
20. During examinations I get so nervous that I forget facts I know	.85		.81		.89	
2. While taking exams I have an uneasy upset feeling		.34		.30		.36
8. I feel very jittery while taking an important test		.71		.70		.67
9. Even when I'm well prepared for a test, I feel very nervous about it		.42		.42		.40
10. I start feeling very uneasy just before getting a test paper back		.44		.42		.44
11. During tests I feel very tense		.33		.38		.29
15. I feel panicky when I take an important test		.90		.81		.94
16. I worry a great deal before taking an important examination		.82		.71		.88
18. I feel my heart beating very fast during important tests		.43		.43		.39
Cronbach's α	.68	.81	.70	.82	.67	.78

Although tested models may be compared by examining $\Delta\chi^2$, as this statistic is sensitive to sample size and sample was relatively large, I used ΔCFI an alternative, where a ΔCFI ≤ .01 indicates invariance (Cheung & Rensvold, 2002). The ΔCFI=.003 between the configurable and metric invariance models indicates that the factor loadings are equivalent in the male and female subsamples. Lastly, a model was tested in which the variances and covariance were constrained to be equivalent across both groups. The ΔCFI <.001 between the latter two models indicates that variances and covariance are equivalent between in the male and female subsamples.

Table 3
Tests of factorial invariance

Model	χ^2	df	RMSEA	CFI	TFI
Female students	258.13***	103	.041	.955	.947
Male students	346.45***	103	.050	.922	.909
Configural Model	622.63***	206	.033	.939	.929
Metric invariance	646.07***	220	.032	.937	.932
Construct variance and invariance	649.80***	223	.032	.937	.932

In summary, it was demonstrated that the two-factor first order model of worry and emotionality with eight items each is equivalent for male and female students, and between group differences, can be examined. Factor loadings for the male and female subsamples are reported in Table 2. Low factor loadings (<.4) are again reported for one worry item (item 5) and two emotionality items (items 2 and 11) in both male and female subsamples and also for an additional emotionality item (item 18) in the male subsample. Reliability coefficients are acceptable (α >.7) for the emotionality factor and marginally (α ≥ .67) under for the total sample and male subsample.

Gender Differences

A one-way between-participants multivariate analysis of variance was conducted with gender as between-participants factor and worry and emotionality scores, and a total TAI score (comprised of all 20 questions: Total sample α = .85; female α = .87; male α = .84) as the dependent variables. The omnibus test indicated significant gender differences: Λ = .94, $F(3,1181)$ = 41.62, p <.001 and so univariate analyses were followed up separately for each dependent variable (descriptive statistics are reported in Table 4). Female students reported small but significantly higher TAI total (F = 44.03, p<.001, η_p^2= .02) and emotionality scores (F = 71.58, p<.001, η_p^2= .04) but not worry scores (F = 3.42, p =.07, η_p^2< .01).

Table 4
Descriptive statistics for TAI scores by gender

	TAI Total Scores		Worry		Emotionality	
	M	*SD*	*M*	*SD*	*M*	*SD*
Whole Sample	42.58	10.07	16.11	4.53	17.67	5.09
Female students	44.20	10.33	16.32	4.64	18.71	5.11
Male students	41.14	9.62	15.93	4.41	16.76	4.90

Bivariate Correlations with Educational Performance

Reported in Table 5, test anxiety shows significant inverse relations with academic performance which are significantly stronger in the worry than the emotionality component for aggregated performance (z = -4.23, p<.001), math's (z = -3.50, p<.001), physics (z = -4.46, p<.001) and biology (z = -3.19, p<.001). Significant intercorrelations are reported for the worry and emotionality components of test anxiety, which also correlate strongly with the total score, and academic performance in math, physics, chemistry and biology.

Table 5
Bivariate correlations between TAI scores and educational performance

	2.	3.	4.	5.	6.	7.	8.
1. TAI Total	.89	.92	-.22	-.20	-.20	-.20	-.25
2. Worry	--	.67	-.26	-.24	-.26	-.24	-.30
3. Emotionality		--	-.15	-.13	-.12	-.14	-.17
4. Maths			--	.61	.63	.57	.81
5. Physics				--	.69	.58	.75
6. Chemistry					--	.70	.83
7. Biology						--	.78
8.Aggregated Grade							--

All relations significant at p<.01

Discussion

The aim of this study was to translate the TAI into Urdu and then examine the factorial validity, reliability, discriminant validity in a sample of Pakistani students, along with gender differences in TAI and component scores. A two-factor model of the U-TAI, based on the worry and emotionality components showed an acceptable model fit and internal reliability. Furthermore, this factor structure was shown to be equivalent for male and female students. As expected, female students reported significantly higher test anxiety scores,

which are attributable to differences on the emotionality component only. Also, consistent with our prediction, a small but significant, inverse relationship was reported between test anxiety and performance in math and science school leaving examinations. Evidence of discriminative validity was also shown through the significantly stronger relations with performance reported for the U-TAI worry scale. Thus, the results were satisfactory, showing sufficient validity and reliability to be used in future research with confidence.

It was, however, considered that the validation process was incomplete. Low factor loadings were reported for several items, suggesting that these items may not be as relevant to the Pakistani context. Further work may wish to examine the usability of these items and whether they could be replaced with more appropriate items. Having established that the fundamental cognitive and affective-physiological factors have been demonstrated with our sample of Pakistani students, future work may also wish to examine whether the test anxiety construct and domain should be expanded to include other components. A fear of being judged negatively by others (such as peers, parents and teachers) has been included in more recent test anxiety measures (Bodas, Ollendick,& Sovani, 2008; Friedman & Bendas-Jacob, 1997), often labelled as social derogation. Before such additional components are added, at the risk of imposing an inappropriate construct from one culture to another, preliminary work is required to establish which constructs are relevant to the host culture and what those domains might consist of (Bodas et al., 2008).

The findings for gender differences are consistent with those previously reported in the literature, but do not add to the weight of evidence for the presentation of socialization explanations. Future work may then wish to explore the possibility of measuring test anxiety via an implicit association task, used to examine gender differences in trait anxiety (Egloff & Scmuckle, 2004), which are less prone to presentation bias. If gender differences in test anxiety remained as an implicit association task, presentational effects could be ruled out. The researcher's findings for the test anxiety and examination performance relationship were also consistent with previous work. The interfering role of worry has been long established, however recent advances afforded by attentional control theory have allowed a much more specific understanding of how anxiety influences working memory processes (Derakshan, Ansari, Shoker, Hansard,& Eysenck, 2009; Eysenck, Santos, Derekeshan,& Calvo, 2007). Building on Owens et al. (2008) this work could be usefully extended to investigate specific hypotheses about the influence of test anxiety on educational performance and achievement, through diminished working memory capacity and functioning. The possibility is also highlighted that training students to improve working memory capacity (Gathercole & Packiam-Alloway, 2008) might prove effective in ameliorating the negative impact of anxiety on performance, and therefore become a useful intervention for students with high test anxiety.

As already highlighted, the principal weakness of this study is that as a replication study concerned with validation of the U-TAI, it does not advance theory. The research is useful however, in providing an instrument to measure test anxiety, which can be used with Urdu speaking persons. In summary, our

study has translated the TAI into Urdu and established the factorial validity and internal reliability of that measure. We have also demonstrated how this measure shows the expected gender differences and relations with educational performance (this demonstrating divergent validity), and identified ways in which the U-TAI could be used to extend the extant literature.

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