Research / Araştırma

Cross-Cultural Metric Equivalence of Somatization, Depression, and Anxiety Scales Across Turkish and U.S.A. University Students

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ABSTRACT

Cross-cultural metric equivalence of somatization, depression, and anxiety scales across Turkish and U.S.A. university students

Objective: The purpose of the present study was to gain a better understanding of cross-cultural differences in somatization, depression, and anxiety.

Method: The author compared the factor structure of depression, anxiety, and somatization across Turkey and the U.S.A., and investigated the metric invariance of the instruments used to measure these constructs. Data from 778 Turkish and U.S.A. participants were used for the analyses.

Results: It was found that depression, somatization, and anxiety are three distinct but related constructs for both Turkish and U.S.A. participants. It was also found that the instruments, namely the Beck Depression Inventory-II, Trait subscale of the State Trait Anxiety Inventory, and the Symptom Check List 90-R Somatization subscale, do not have metric invariance across the two cultures. These instruments do not measure the same construct across Turkey and the U.S.A.

Conclusion: The results were consistent with the way depression, anxiety, and somatization are conceptualized in the DSM-IV as separate constructs, but contradicted Krueger et al.'s findings.

Key words: Anxiety, cross-cultural, depression, invariance, somatization

ÖZET

Somatizasyon, depresyon ve kaygı ölçeklerinin kültürler arası metrik eşitliğinin Türkiye ve Amerika'daki üniversite öğrencilerinde incelenmesi

Amaç: Bu çalışmanın amacı, somatizasyon, depresyon ve anksiyete arasındaki ilişkinin kültürler arası farklarını incelemektir.

Yöntem: Bu yapıların Türkiye ve Amerika'daki faktör yapısı kıyaslanmış ve ölçülmelerinde kullanılan araçların metrik değişmezliği araştırılmıştır. Analizler için Türkiyeli ve Amerikalı 778 katılımcıdan elde edilen veriler kullanılmıştır.

Bulgular: Somatizasyon, depresyon ve anksiyetenin hem Türkiyeli hem de Amerikalı katılımcılar için birbirinden ayrı ancak birbiri ile ilgili üç yapı olduğu anlaşılmıştır. Ayrıca kullanılan araçlar olan Beck Depresyon Envanteri-II), Durumluk-Sürekli Kaygı Envanteri Sürekli Kaygı alt testi ve Ruhsal Belirti Tarama Listesi 90-R Somatizasyon alttesti araçlarının bu iki kültür arasında metrik değişmezliğe sahip olmadığı tespit edilmiştir. Bu araçlar, Türkiye ve Amerika genelinde aynı yapıyı ölçümlememektedirler.

Sonuç: Sonuçlar, depresyon, anksiyete ve somatizasyonun DSM-IV'de ayrı yapılar olarak kavramlaştırılmış olması ile tutarlı, Krueger ve arkadaşlarının bulgularına aykırı bulunmuştur.

Anahtar kelimeler: Anksiyete, kültürler arası, depresyon, değişmezlik, somatizasyon

INTRODUCTION

While some psychological problems are thought to be universal, others are culture specific (1). Somatization is considered culture specific in the way it is expressed and its prevalence rate (2). An investigation of how cultural factors influence the expression of somatization is important to effectively and accurately assess and treat this psychological disorder. Thus, the purpose of the current study is to explore the way Turkish and U.S.A. participants express distress and investigate somatization from a cross-cultural perspective.

The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (3) defines Somatization Disorder as: "A history of many physical complaints beginning before age 30 years that occur over a period of several years and result in treatment being sought or significant impairment in social, occupational, or other important areas of functioning". According to the DSM-IV, demographic variables such as ethnic origin, cultural background, and gender influence the expression and prevalence of somatization disorder.

Although several models provide insight into somatization, conceptualizing somatization as an idiom of distress places special emphasis on the influence of culture on somatization. According to the idioms of distress model, somatization is a culture specific expression of distress, which serves to normalize persons' experience of distress (4). In certain cultures, such as the Turkish culture, there may be a stigma against psychological disorders and emotional or cognitive symptoms of distress. In these cultures, however, bodily symptoms of distress are accepted by the society. Therefore, bodily symptoms, such as a lump in the throat and back pain, are a way of expressing and communicating distress.

An extensive cross-cultural study by the World Health Organization (WHO) (5) provided support for the effect of culture on prevalence of somatization. Gureje et al. (5) examined the prevalence of somatization and other psychological disorders in 14 different countries including Turkey and U.S.A. The authors recruited patients seeking services from general health care facilities in each country and found that Somatization Disorder as defined by the International Classification of Diseases-10 (6) and the DSM-III-R (7) had a low prevalence rate and did not vary much by countries. Yet, a less restrictively defined form of somatization measured by the Somatic Symptom Index (SSI) (8) was overall more common and more variant among these fourteen countries (5).

Escobar et al. (8) described the SSI as a measure of a new and abridged somatization construct. The purpose of SSI was to measure below-threshold somatization. To meet this purpose, Escobar et al. (8) reduced the number of symptoms required for the diagnosis of somatization while preserving the predictive value of the full diagnosis. When somatization was operationalized by SSI, prevalence rates of somatization increased and differed significantly across the 14 countries studied (5). For instance, 25.2% of patients from Turkey had a somatization disorder based on SSI criteria, compared to 9.8% of patients from U.SA.

Findings from studies done in Turkey provide support for the relationship between somatization depression and anxiety, and the notion that somatization is a culture-specific way of expressing distress. Ozkan et al. (9) found that somatization is highly comorbid with generalized anxiety disorder, depression, and anxious depression for Turkish persons. Kaygisiz and Alkin (10) also found that somatization is highly comorbid with depression and anxiety among Turkish patients. They suggested that due to such high comorbidity, somatization symptoms might be considered as indicators of depression rather than a separate somatization disorder. Moreover, Ulusahin et al. (11) found that Turkish patients had higher scores for somatic symptoms of depression, whereas their British counterparts had higher scores for psychological complaints such as guilt and pessimism.

In addition to quantitative studies, qualitative studies seem to support the notion that somatization is a culture-specific expression of distress. A set of five studies compared somatization among Turkish-born Swedish immigrant women and native Swedish women (12). The women were interviewed to gain a better understanding of their symptoms' meaning. Results showed that the Turkish-born women used the heart as a way of communicating emotional distress and problems, by using phrases such as "tightness in the heart." Additionally, the Turkish-born women were less familiar with psychological terms such as depression and anxiety compared to the Swedish women. Based on these findings, Baarnhielm (12) concluded that somatic symptoms were idioms of distress for individuals from different cultures and should not be viewed as abnormal manifestations of psychopathology.

The high comorbidity between somatization, depression, and anxiety, especially among Turkish

populations (9-11), suggests that somatic symptoms are expressions of distress (2). The factor structures of depression, anxiety, and somatization across cultures have been examined previously. In their study, Krueger et al. (13) used data from the WHO Collaborative Study of Psychological Problems in General Health Care (14) and factor analyzed patients' lists of psychological symptoms. The analyses were based on symptom counts (i.e., the number of symptoms that were present for each diagnostic category), instead of a presence versus absence of psychopathology, using the Composite International Diagnostic Interview (CIDI) (15). The CIDI is a structured interview schedule based on the diagnostic criteria of ICD-10 (6) and the DSM-III-R (7). All participants were patients seeking primary health care.

The results showed that the data from Turkey were best represented by two factors. The first factor included symptoms of depression, anxious worry, anxious arousal, somatization, hypochondriasis, and neurasthenia. The second factor was comprised of hazardous use of alcohol. For U.S.A., in contrast, three factors emerged. The first factor included symptoms of depression, anxious worry, and anxious arousal, the second factor had symptoms of somatization, hypochondriasis, and neurasthenia, and the third factor consisted of items describing hazardous use of alcohol. These results indicate that depression, anxiety, and somatization were highly interrelated for the Turkish participants, whereas somatization was distinct from depression and anxiety for the U.S.A. participants.

Although Krueger et al.'s (13) study provides important findings about the factor structure of depression, anxiety, and somatization's symptoms, the study's restricted sample (patients seeking medical services) and the instrument's limited cross-cultural validity (16) may compromise the generalizability and the internal validity of its findings. Thus, the question still remains whether somatization, depression, and anxiety are interconnected for Turkish and U.S.A. participants. Building on Krueger et al.'s (13) study, the purpose of the current investigation is to compare somatization, depression, and anxiety as experienced by Turkish and U.S.A. populations using instruments that have demonstrated validity in both countries.

It is hypothesized that depression, anxiety, and somatization will have a different construct structure in Turkey than they have in the U.S.A. That is, the factor structure that best represents the Turkish sample will be different from the factor structure that best represents the U.S.A. sample. For the Turkish sample, anxiety, depression, and somatization will be so highly correlated that they will comprise one construct. That is, a one-factor model will best represent the underlying factor structure of the responses to the three instruments. For the U.S.A. sample, anxiety, depression, and somatization will comprise three separate constructs. That is, a three factor model, with one factor representing depression, one representing anxiety, and one representing somatization, will best represent the underlying factor structure of the responses to the three instruments. This hypothesis will test the construct equality of distress across the Turkey and the U.S.A.

Provided that the same factor structure emerges as the best model for both samples, an invariance analysis will be performed. According to the second hypothesis, the model that best fits the Turkish and the U.S.A. data will vary across samples. The model's factor loadings, factor variances and covariances will be significantly different across samples. This prediction is based on the notion that the Turkish and the U.S.A. students would experience depression, anxiety, and somatization differently and the relationship between these disorders would be different across samples. This hypothesis will test the measurement equivalence of the Beck Depression Inventory-II (BDI-II) (17), State Trait Anxiety Inventory-Trait Subscale (STAI-Trait) (18,19), and Symptom Checklist-90-Revised Somatization Subscale (SCL-90-R-Somatization) (20).

METHOD

Sample

A convenience sample of 355 Turkish undergraduate students from a government university at the Aegean Region of Turkey and 500 U.S.A. undergraduate university students at a Midwestern state university

were recruited for the study.

Two U.S.A. and 15 Turkish students had more than 10% of their data missing and were excluded from the study based on Tabachnick and Fidells' recommendations (21). To determine if outlier responses existed in the data, Mahalanobis distance values were calculated (22). Eleven of the U.S.A. participants had significant Mahalanobis distance values (χ^2 (53)=90.57, p<0.001) and showed characteristics of non-traditional students (e.g. older age). The data from these participants were determined to be outliers and were also excluded from the study. As a result, data from 487 U.S.A. and 340 Turkish students were left for the study.

Among 487 remaining U.S.A. students, 219 (45%) were men and 268 (55%) were women, whereas among 340 Turkish students, 184 (54%) were men and 156 (46%) were women. The mean age of the Turkish students was 20.7 (SD=1.6) years. The mean age of the U.S.A. students was 20.9 (SD=3.7) years. Turkish students' ages ranged between 17 and 26. The U.S.A. students' ages ranged between 18 and 51. Four hundred and thirty nine of the U.S.A students (90%) identified as White, 30 (6%) as Black, 10 (2%) as Hispanic, 3 (0.6%) as Asian or Pacific Islander, 1 (0.2%) as American Indian or Alaskan Native, and 5 (1%) students indicated other racial or ethnic background. The racial or ethnic background of the Turkish participants was not assessed. It is estimated, however, that approximately 90% of the Turkish people identify as citizens of Turkish Republic, Turk, or Muslim, and 1.4% identify as Kurdish (22).

Measures

The Beck Depression Inventory-II (BDI-II): Depression was measured with the Turkish and the English versions of BDI-II (17). The BDI-II includes 21 items about depressive symptoms and attitudes (17,23). Each item is rated on a 4-point scale ranging from 0 to 3. Participants are asked to choose the option that best describes the way they have felt during the past two weeks (17). The item scores are added to obtain a total depression score. The scores range between 0 and 63, with higher scores indicating more severe depression.

In support of reliability for outpatients, the coefficient alpha of the BDI-II was 0.92. For college students it was 0.93 (17). The item-total correlations ranged between 0.27 (loss of interest in sex) and 0.74 (self-dislike) for the student sample (17). In support of convergent validity, the correlation between the BDI-II scores and Beck Hopelessness Scale (24) was 0.68 (17). The correlation between the BDI-II and the Scale for Suicide Ideation (25) was 0.37 (17). In support of discriminant validity, as reported by Beck et al. (17), the correlation between the BDI-II and Hamilton Psychiatric Rating Scale for Depression (26) scores was higher than the correlation between the BDI-II and Hamilton Rating Scale for Anxiety scores (0.71 and 0.47 respectively) (17,27). Additionally, and in support of the measure's construct validity, the mean BDI-II score of outpatients has been found to be significantly higher than the BDI-II scores of college students (17). Similarly, Beck et al. (17) reported that outpatients with mood disorders scored significantly higher on the BDI-II than outpatients with anxiety or adjustment disorders.

A translated and validated Turkish version of the BDI-II is not available in the literature. However, an earlier version of the BDI-II, the BDI-IA (28) has been translated to Turkish (29). The English version of the BDI-IA was modified to construct the BDI-II. In the construction of the English version of BDI-II, several BDI-IA items were reworded and new items were added (17). For instance, the insomnia and appetite items in the BDI-IA were changed to reflect both increase and decrease in sleep and appetite. Items that were not included in the BDI-IA, such as agitation, worthlessness, concentration difficulty, and loss of energy were included in the BDI-II. In addition, some of the labels for the BDI-IA items were changed. For instance, self-accusations were reworded as self-criticalness. Only three of the BDI-IA items were not changed. Despite these changes, the correlation between the English versions of the BDI-II and BDI-IA (0.93) was high (17).

Because the BDI-II has not been translated to Turkish, information on the psychometric properties of the instrument's Turkish version is not available. However, information on the psychometric properties of the Turkish version of the BDI-IA is available. The

BDI-IA was translated to Turkish in 1988 and tested by Hisli (29). In order to support the equality of the linguistic versions, the Turkish and English versions of the BDI-IA were both administered to a group of bilingual Turkish students. The correlation between the Turkish and the English versions ranged between 0.73 and 0.81, which supported the equality of the linguistic versions (29). In support of the reliability of the Turkish version of the BDI-IA, the split half reliability coefficient was 0.78 for Turkish students and 0.61 for depressed psychiatric inpatients (30).

In order to establish the construct validity of the Turkish version of the BDI-IA, it was administered with Cognitive Reactions Inventory of Depression (CRID) (30), which is a psychological instrument developed specifically for Turkish persons to measure cognitive distortions. The results showed that the Pearson correlation coefficient between the BDI and CRID was 0.52 (p<0.01) for the depressed group. These results indicate that the depressed outpatients' BDI scores are significantly and positively related to cognitive distortions, which support the construct validity of the Turkish version of the BDI-IA. In addition, the BDI scores of the clinical sample were compared to the clinicians' diagnosis of these individuals. The clinician's diagnosis of depression were compatible with the scores on the BDI for 58 of the 60 patients (97%), which support the criterion validity of the instrument.

To establish concurrent validity, the BDI-IA was compared to the Multiscore Depression Inventory's Turkish version (31). The Pearson correlation between these two scales was 0.77. The BDI-IA Turkish version was also compared to the Depression sub-scale of MMPI's Turkish version (29). The correlation coefficient between the BDI-IA and MMPI's Depression sub-scale was 0.63 for the Turkish clinical sample. The author concluded that the BDI-IA Turkish version is a valid instrument in detecting symptoms of depression.

Because a Turkish translation of the BDI-II is not available, the BDI-II (17) was translated to Turkish using a translation-back-translation procedure (32,33). The first author, who is bilingual in Turkish and English, translated the English version of the BDI-II to Turkish. BDI-IA's Turkish version (29) was used as a guide in

translation. Another bilingual person translated the Turkish version back to English. The original English version and the back-translated version were then compared by a committee of two individuals experienced in translating psychological instruments (see 35 for a detailed description of the translation back-translation procedure and the cross-cultural factor invariance of Turkish BDI-II). For the current study, the Cronbach's alpha for the Turkish version of the BDI-II was 0.87 and for the English version it was 0.90.

The State-Trait Anxiety Inventory-Trait Subscale (STAI-Trait): Anxiety was measured with the English (18,19) and the Turkish (35) versions of STAI-Trait. The STAI-Trait measures persons' level of anxiety as a long-term trait and consists of 20 items. Items are rated on a four point Likert-type scale ranging from 1 (indicating low frequency) to 4 (indicating high frequency). The items that indicate no anxiety are reversed so that higher scores indicate higher levels of trait anxiety. Spielberger et al. (18) found that the test-retest coefficients for the English version of STAI-Trait ranged between 0.73 and 0.86. Kuder-Richardson internal reliability coefficients were found to range between 0.83 and 0.92 for trait anxiety.

In terms of concurrent validity, the STAI has been positively correlated with Institute for Personality and Ability Testing (IPAT) Anxiety Scale (0.75), Manifest Anxiety Scale (0.80), and with Affect Adjective Check List (0.52). Results obtained from the standardization sample showed that the trait anxiety levels of psychiatric patients (except those diagnosed with personality disorders) were significantly higher than the anxiety levels of non-psychiatric hospital patients (18).

In line with Brislin's (32) recommendations, STAI-Trait was translated and back-translated by Turkish psychology professors (35). The English and the Turkish versions of the measure were administered to a group of 200 bilingual university students in Turkey. Two weeks after the initial administration the participants who initially received the Turkish version received the English version and vice versa. The scores from the two versions were compared and no significant differences were found. Despite the comparability of the scores,

however, six STAI-Trait items (items 22, 23, 25, 30, 33, 34) were different across linguistic versions. The Turkish and the English versions of these items had different content. This difference in item content weakens the total score comparisons between the Turkish and the English versions of the instrument.

Normative data was gathered from 1534 non-clinical Turkish participants and 200 psychiatric patients (35). The test-retest reliability of the Turkish version ranged between 0.71 and 0.86 for the trait anxiety. Alpha coefficients ranged between 0.83 and 0.87 for the trait anxiety (35). The validity of the Turkish version was established through comparison of the STAI scores of psychiatric patients, non-psychiatric hospital patients, and a non-clinical control group. In support of the Turkish STAI's construct validity, the results revealed that the trait anxiety levels of psychiatric patients were significantly higher than the non-clinical control group and the non-psychiatric hospital patients (35).

In another study using the Turkish version of the STAI, Aydin (36) compared the trait anxiety levels of patients presenting with psychological headaches and patients with physiological headaches. The author defined psychological headaches as those with no organic etiology, including migraines and tension headaches. He defined physiological headaches as those with an organic etiology such as sinus headaches. As predicted, patients with psychological headaches had higher levels of trait anxiety than patients with physiological headaches. The author reported that there were no significant differences in trait anxiety scores between men and women with psychological headaches. In the current study, the Cronbach's alpha values were 0.93 and 0.88 for the English and Turkish versions of STAI-Trait respectively.

The Symptom Check List 90-Revised-Somatization Subscale (SCL-90-R-Somatization): Somatization was measured with the English (20) and Turkish (37) versions of SCL-90-R-Somatization. The SCL-90-R-Somatization contains 12 items measuring complaints about the cardiovascular, digestive, and other bodily functions and uses a Likert-type answer

format. The answers are scored between 0 (not at all) and 4 (extremely). The total score for the sub-scale is calculated by adding the scores from twelve items and dividing the total by twelve. Higher scores indicate higher levels of somatic complaints.

Derogatis (20) reported that alpha coefficients for the English version of SCL-90-Somatization subscale ranged from 0.86 to 0.88. The test-retest reliability coefficient of the somatization subscale ranged from 0.68 to 0.86. In terms of convergent and divergent validity, SCL-90-R subscales had higher correlations with similar MMPI constructs (e.g., hypochondriasis) than the dissimilar MMPI constructs (e.g., hypomania) (20). Kellner et al. (38) found that somatization and anxiety, as measured by SCL-90-R, were predictive of hypochondriacal fears and beliefs, whereas depression was not. In addition, they reported that somatization scores from the SCL-90-R were highly associated with a false conviction of having a disease. In another study, it was found that clients obtaining high scores from the somatization subscale of SCL-90-R at a university medical clinic had high prevalence of psychiatric disorders and substance abuse histories. The clients with high somatization scores also had the highest mean SCL-90-R scores compared to the other groups (39). These studies indicate that SCL-90-R-Somatization has acceptable levels of reliability and validity.

A Turkish version of the SCL-90-R has been prepared by Kilic (37). Information on the translation and back-translation procedure is not available. Kilic (37) administered it to a group of 122 university students and the test-retest reliability coefficient for the Somatization subscale was 0.82. Kilic (37) also found that students who scored high on SCL-90-R also reported experiencing high levels of school-related problems and emotional problems. Further, Kilic stated that the Turkish version of the SCL-90-R was easy to understand and that the participants did not experience difficulty in understanding and responding to the items on the scale.

In support of the construct validity of the instrument, Aydin (36) found that the patients presenting with psychological headaches had significantly higher SCL-90-R-Somatization scores than patients presenting with

physiological headaches. These results indicate that the scores on Turkish version of SCL-90-R-Somatization can accurately differentiate between individuals presenting with somatic symptoms and those presenting with medical symptoms, which provides further support for the construct validity of the SCL-90-R Somatization subscale. For the current study, the Cronbach's alpha values were 0.79 and 0.85 for the English and the Turkish versions of SCL-90-R-Somatization respectively.

The demographic form: The demographic sheet included questions about gender, age, marital status, race/ethnicity (only for U.S.A students), religion, number of years in school, and major. In order to estimate the participants' socio-economic status the demographic sheet also included questions about number of siblings, personal income, and parents' income.

Procedure

Administration of the instruments

The participants were recruited through universities in Turkey and the USA. Both universities are four-year, degree-granting institutions of higher education. All students read and signed an informed consent form. The U.S.A. students were enrolled in any one of the courses offered by a counseling psychology department, anthropology department, and the college of business. The students who were enrolled in counseling psychology classes and anthropology classes received credit toward completion of a course requirement in exchange for participation. One out of every 25 U.S.A. participants who were enrolled in business classes were randomly selected to receive a $25 gift certificate. The Turkish students were enrolled in various courses offered by colleges of economic and administrative sciences, arts and sciences, and aquatic products. They did not receive any incentives for their participation, because courses in Turkey did not involve a research credit system and it was suggested by Turkish professors that offering a gift certificate would lead some participants

to participate only for the gift and may create an unethically strong incentive to participate. The Turkish and the U.S.A. students in the college of business participated in the study during class periods. The U.S.A. students in counseling psychology and anthropology classes participated during a scheduled time outside of class period. None of the participants participated during midterm or final period. The Turkish and the English versions of the BDI-II, STAI-Trait, and the SCL-90-R-Somatization were administered to the students in a counterbalanced order. It took the students approximately 45 minutes to respond to the questionnaires.

Research design and statistical analysis

Based on Tabachnick and Fidell's (21) suggestions, and in order to proceed with the hypotheses testing using CFA and MCFA, missing values were replaced by the mean score of the variable for each sample. In order to test the first hypothesis predicting that somatization, depression, and anxiety would constitute a single construct for the Turkish sample but three separate constructs for the U.S.A. sample, six alternative models were tested by Confirmatory Factor Analysis for each country separately. These models were: Three Factor Covariance, Three Factor, Two Factor A (the BDI-II; STAI-Trait+SCL-90-R-Somatization), Two Factor B (BDI-II+STAI-Trait; SCL-90-R-Somatization), Two Factor C (BDI-II+SCL-90-R-Somatization; STAI-Trait), and One Factor (BDI-II+STAI-Trait+SCL-90-R-Somatization). The factors in all the two-factor models were allowed to correlate in order to create nested models and compare the Chi square fit indices between the nested models.

For all the models, error terms of the items that have the same content were allowed to correlate. In CFA, items that have the same content and tap into similar ideas can lead to systematic error variance (40). Allowing such items' error terms to correlate can help reduce the effect of such systematic error (41) on model fit. Seventeen error terms in the English versions of the scales and 21 error terms in the Turkish versions of the scales were allowed to correlate for this reason. The Chi square fit index is inflated by sample size and is not

considered appropriate to evaluate the fit of a single model (40,42). Therefore, the comparative fit index (CFI), the Tucker-Lewis Index (TLI), and the Root-Mean-Square Error of Approximation (RMSEA) were used in addition to the Chi square fit index to evaluate the fit of each model to the data.

For the TLI and CFI, fit indices values closer to 1 indicate a better fit. In contrast, for RMSEA, values closer to 0 indicate a better fit (43). According to the widely used fit index criteria, TLI and CFI values higher than 0.95, and RMSEA values lower than 0.06 indicate a good fit (44). Despite their common usage, however, these cutoff scores had been criticized for being too stringent and having little statistical justification (44). Marsh et al. (45) indicated that Hu and Bentler's (44) recommendations may have limited generalizability in typical practice, and that it may be unreasonable to expect such high goodness of fit indices with more than one or two items per factor. They added that lower TLI and CFI cutoff scores, such as 0.80, can accurately discriminate between true and misspecified models. Considering that the models in the current study involved a total of 53 items, it was more appropriate to adopt the more modest cutoff score of 0.80. The model that had the best fit was designated as the baseline model.

In order to test the second hypothesis predicting that the baseline model for Turkish and U.S.A. data would differ across cultures, the relationships between somatization, depression, and anxiety were analyzed through Multi-Sample Confirmatory Factor Analysis (MCFA). As suggested by Joreskog (43) and Byrne (46), the MCFA was conducted in a hierarchical series of steps, each step involving a comparison of a more restrictive model. Initially, all the parameters in the model were allowed to vary across samples. Then the factor loadings were constrained to be equal across the samples and the factor variances and covariances were allowed to vary. Next, the factor variances and covariances, in addition to the factor loadings, were held constant. At each step, the difference in chi square was tested for significance. A significant difference in chi square indicates that the specified model does not fit the samples equally well at that level.

RESULTS

Preliminary Analyses

In order to avoid a potential confounding effect of ethnicity, data from 49 ethnic minority participants were excluded from the U.S.A. data for all the analyses. Mean scores for BDI-II, STAI-Trait, and SCL-90-R-Somatization by gender and nationality were obtained. Table 1 shows the means and standard deviations of scale scores for each country and gender. Table 2 shows the correlation matrix of scale scores for each country. All the correlations were significant at the 0.01 level.

Table 1: Means and standard deviations of scale scores by country and sex

Scales	Turkish Students (n=340; 44%)		U.S.A. Students (n=438; 56%)	
	Mean	SD	Mean	SD
Men				
BDI-II	14.89	9.30	8.95	6.36
STAI-Trait	41.89	10.55	37.76	10.76
SCL-90-R-Somatization	11.69	7.46	6.85	5.78
Women				
BDI-II	14.83	9.08	11.30	8.66
STAI-Trait	44.08	10.22	40.68	10.77
SCL-90-R-Somatization	14.28	7.79	8.24	5.47
Total				
BDI-II	14.86	9.18	10.27	7.82
STAI-Trait	42.90	10.44	39.40	10.85
SCL-90-R-Somatization	12.88	7.71	7.63	5.65

BDI-II: Beck Depression Inventory Second Edition, STAI-Trait: State Trait Anxiety Inventory- Trait Subscale, SCL-90-R-Somatization: Symptom Checklist-90-Revised-Somatization Subscale

Table 2: Correlations between scale scores for Turkish and U.S.A. students

Scales	BDI-II	STAI-Trait	SCL-90-R-Somatization
Turkish (n=340)			
BDI-II	1.00	0.75	0.50
STAI-Trait	0.75	1.00	0.48
SCL-90-R-Somatization	0.50	0.48	1.00
U.S.A. (n=438)			
BDI-II	1.00	0.78	0.56
STAI-Trait	0.78	1.00	0.53
SCL-90-R-Somatization	0.56	0.53	1.00

All the correlations were significant at the 0.01 level (2-tailed).
BDI-II: Beck Depression Inventory Second Edition, STAI-Trait: State Trait Anxiety Inventory- Trait Subscale, SCL-90-R-Somatization: Symptom Checklist-90-Revised-Somatization Subscale

The highest correlation for both the Turkish and the U.S.A. students was between BDI-II and the Trait anxiety sub-scale of STAI (0.78 for U.S.A. students and 0.75 for Turkish students).

Main Analyses

To test the hypothesis about a different structure of the depression, anxiety, and somatization constructs in Turkey and the U.S.A., a series of Confirmatory Factor Analyses (CFA) were conducted for each country separately. Table 3 shows the Chi square statistics and the fit indices for the six models for each country separately. For the Turkish students, TLI values ranged between 0.73 and 0.84, CFI values ranged between 0.74 and 0.85, and RMSEA values ranged between 0.05 and 0.06. For the U.S.A. students, the TLI values ranged between 0.73 and 0.81, CFI values ranged between 0.74 and 0.82, and RMSEA values ranged between 0.06 and 0.07. The Three Factor Covariance model had the highest TLI and CFI and the lowest RMSEA values for both Turkish and U.S.A. students. Based on the criteria for fit indices mentioned in the method section, it is concluded that the Three Factor Covariance model showed adequate fit for both the Turkish and the U.S.A. data.

To evaluate the statistical significance of the difference between nested models, difference in Chi square values were calculated. The differences in Chi square values, their respective degrees of freedom, and their probability levels are reported in Table 4. According to these values, the Three Factor Covariance model had significantly better fit than all the other models for both the Turkish and the U.S.A. data. Moreover, and in contrast to the first hypothesis, the One Factor Model

Table 3: Confirmatory Factor Analysis Chi square statistics and fit indices by country

Factor Models*	χ^2	df	TLI	CFI	RMSEA
Turkish Students					
1 Factor	2811.55	1304	0.73	0.74	0.06
2 Factor A	2669.05	1303	0.76	0.77	0.06
2 Factor C	2638.14	1303	0.76	0.77	0.06
3 Factor	2608.85	1304	0.77	0.78	0.05
2 Factor B	2314.01	1303	0.82	0.83	0.05
3 Factor Cov.	2190.53	1301	0.84	0.85	0.05
U.S.A. Students					
1 Factor	3811.80	1308	0.73	0.74	0.07
3 Factor	3628.18	1308	0.75	0.76	0.06
2 Factor A	3488.31	1307	0.76	0.77	0.06
2 Factor B	3439.29	1307	0.77	0.78	0.06
2 Factor C	3388.85	1307	0.77	0.78	0.06
3 Factor Cov.	3065.21	1305	0.81	0.82	0.06

*The models are ordered from the highest Chi Square value to the lowest Chi Square value for each country.

Table 4: Differences in Chi square statistics for nested models by country

Nested Models	Δ χ²	Δ df	p
Turkish Students			
1 Factor-2 Factor A	142.50	1	<0.001
1 Factor-2 Factor B	497.54	1	<0.001
1 Factor-2 Factor C	173.41	1	<0.001
1 Factor-3 Factor Cov.	621.02	3	<0.001
2 Factor A-3 Factor Cov.	478.52	2	<0.001
2 Factor B-3 Factor Cov.	123.48	2	<0.001
2 Factor C-3 Factor Cov.	447.61	2	<0.001
3 Factor-3 Factor Cov.	418.32	3	<0.001
U.S.A. Students			
1 Factor-2 Factor A	323.49	1	<0.001
1 Factor-2 Factor B	372.51	1	<0.001
1 Factor-2 Factor C	422.95	1	<0.001
1 Factor-3 Factor Cov.	746.59	3	<0.001
2 Factor A-3 Factor Cov.	423.10	2	<0.001
2 Factor B-3 Factor Cov.	374.08	2	<0.001
2 Factor C-3 Factor Cov.	323.64	2	<0.001
3 Factor-3 Factor Cov.	562.97	3	<0.001

Table 5: Multi-sample Confirmatory Factor Analysis with Turkish and U.S.A. students

Steps	χ²	df	Δ χ²	Δ df	p
First Step	5255.68	2606			
Second Step	5408.41	2650	152.74	44	<0.001
Third Step	5471.00	2656	62.59	6	<0.001

In the first step, all the parameters were allowed to vary freely across samples. In the second step, factor loadings were constrained across samples. In the third step, factor variances and covariances, as well as factor loadings were constrained.

had significantly worse fit than all the two-factor models and the Three Factor Covariance model for the Turkish data. Therefore, the first hypothesis was not supported. That is, based on these data, depression, anxiety, and somatization appear to be three related but separate constructs in both Turkish and U.S.A. samples.

In order to test the second hypothesis that the factor loadings and factor variances and covariances of the baseline model would vary significantly across samples, a Multi-Sample Confirmatory Factor Analysis (MCFA) was conducted on the Three Factor Covariance model. Based on a-priori item content analysis, 21 error terms were allowed to correlate for the Turkish sample and 17 error terms were allowed to correlate for the U.S.A. sample. The error terms and the correlation between the error terms were not tested for invariance across samples, because the invariance analysis of error terms is considered to be highly restrictive (41). In addition, six STAI-Trait items (items 22, 23, 25, 30, 33, and 34) were

allowed to vary, because the contents of these items are not equal across linguistic versions of the scale.

Table 5 shows the Chi square statistics for each step of MCFA, the corresponding degrees of freedom, the change in Chi square statistics, and the probability level of the change in Chi square statistics. The change in Chi square statistics represents the difference between each step following the first step (e.g., difference between step 1 and step 2, step 2 and step 3). As Table 5 shows, the Chi square difference between Step 1 and Step 2 was significant, indicating that the factor loadings were different across the Turkish and the U.S.A. samples. In addition, the Chi square difference between step 2 and Step 3 was also significant indicating that factor variances and covariances are not equal across samples. Hence, the second hypothesis that the baseline model will vary significantly across samples was confirmed. That is, distress as measured by BDI-II, STAI-Trait, and SCL-90-R-Somatization has different meanings for the

Turkish and the U.S.A. students and the relationship between these constructs is not the same for the Turkish and the U.S.A. students.

DISCUSSION

In the first hypothesis, it was predicted that a one-factor model would best represent the underlying factor structure of distress for the Turkish sample, whereas a three-factor model would best represent the factor structure of distress for the U.S.A. sample. Contrary to what was expected, the factor structure of distress was the same across countries. This finding concurs with the DSM's (3) conceptualization of depression, anxiety, and somatization. In the DSM distress is not discussed as a condition, as it was in the current study. Yet, in the DSM depression, anxiety, and somatization are discussed as separate but related disorders. The findings from the current study support the DSMs' conceptualization of depression, anxiety, and somatization as separate but related constructs, and provide some support for the DSMs' cross-cultural validity on how these disorders are conceptualized.

The finding that distress has a three factor structure for both the Turkish and the U.S.A. students contradicts Krueger et al.'s (13) study that found depression, anxiety, and somatization had different factor structures for the Turkish and the U.S.A. patients. There might be several reasons for the difference between results from the current study and the findings from Krueger et al.'s (13) study. One reason could be the difference between the educational levels of the Turkish and the U.S.A. participants in each study. Studies have shown that individuals with lower SES levels and less education have higher levels of somatization compared to those with higher SES levels (45,47) The results from the WHO study (5), for instance, indicated that participants with six or more years of formal education had a modestly lower risk of somatization than those with fewer or no years of education. Moreover, in the WHO primary care study the participants from Turkey typically had five years of education and 19% of the patients had never been to school, whereas 89% of the participants from the U.S.A. had 13 or more years of

education (14). Consequently, Krueger et al.'s (13) findings, which were based on data obtained from WHO primary care study, could be confounded by the differences in the levels of education between the U.S.A. and the Turkish participants.

In the current study, on the other hand, the participants from Turkey and the U.S.A. were enrolled in similar four-year institutions of higher education. Thus, the level of education was held constant between the samples and the effect of education on somatization was equal for both groups. Those with higher levels of education may view emotional and cognitive symptoms of distress as separate from the somatic symptoms of distress and be less likely to somatize depression or anxiety. Consequently, the Turkish and the U.S.A. students with similar levels of education would be more likely to experience depression, anxiety, and somatization as separate entities. Thus, the difference in factor structure of somatization found previously (13) between the U.S.A. and Turkish patients disappeared when participants´ education level was held constant. That is, education, not nationality, may explain the difference in the factor structure of somatization.

Another reason for the difference between the current findings and Krueger et al.'s (13) findings could be the difference in the settings in which these studies took place. The participants in Krueger et al. (13) study were patients presenting to primary care facilities, whereas in the present study participants were university students. Patients presenting to primary care facilities may be more likely to report physical symptoms, knowing that medical doctors are more likely to assess physical symptoms rather than emotional or cognitive symptoms of distress. Thus, it could be argued that the results from Krueger et al. (13) study may be an artifact of the setting. In contrast, the current study was performed in a university setting and thus the participants were not inadvertently prompted to report bodily symptoms. Therefore, the bias towards reporting somatic symptoms was eliminated and the setting did not confound the results.

In the second hypothesis it was predicted that the baseline model's factor loadings, and factor variances

and covariances would be significantly different across samples. This hypothesis was confirmed. Thus, item loadings on each of the factors, and factor variances and covariances (correlations between the factors) varied significantly across samples. That is, STAI-Trait, BDI-II, and SCL-90-R-Somatization lacked metric equality across samples. Thus, distress as measured by these three instruments may not mean the same thing for Turkish students and U.S.A. students. This finding supports previous findings indicating that Turkish persons may experience distress different from Western persons, such as British (11) and Swedish (12) persons.

In summary, although some of the results obtained from the current study corresponded with the results obtained from previous studies, some did not. The finding that the Three Factor Covariance model had the best fit both the Turkish and the U.S.A. data contradicted with Krueger et al.s' (13) findings, but corresponded with the DSM-IVs' (3) conceptualization of depression, somatization, and anxiety as separate disorders. However, the current study used different instruments to measure depression, anxiety, and somatization, used a different type of sample, and was conducted at a different type of setting. Thus, the comparison between the current findings and the previous findings should be done with caution. On the other hand, the second hypothesis predicting that the factor loadings, factor variances, and factor covariances would vary significantly across countries was confirmed. This finding showed that the metric qualities of the instruments used are different for the Turkish and the U.S.A. populations and these cultural groups experience distress differently. The current findings should also be evaluated in light of the limitations of the study.

The current study had several limitations. The U.S.A. and the Turkish university students were not selected randomly. Instead, convenience sampling was used to recruit the participants. Therefore, the Turkish and the U.S.A. samples may not represent the university students in these countries. Moreover, the university students represent a small fraction of the population at large, especially in Turkey, but also in USA. Therefore,

the results have limited generalizability for the Turkish and the U.S.A. societies. Additionally, six of the items in STAI-Trait were not equal across linguistic versions. These items had different content in the Turkish version than in the English version and were excluded from the MCFA across cultures. Therefore, an invariance analysis with the complete STAI-Trait could not be conducted and the results are limited to the invariance of only 14 STAI-Trait items.

Moreover, self-report data were used, which can limit the internal validity of the results. Although the participants were assured that their responses would remain anonymous, response biases such as social desirability might have limited the internal validity of the study. Social desirability might have motivated the participants, especially the Turkish participants, to appear healthy and curtail their responses to those questions that involve psychological symptoms. The Turkish students were more likely to have pre-existing relationships with one another due to their enrollment in the same courses. Thus, social desirability may have affected the Turkish students more than the U.S.A. students.

In this project, the factor structure and factor invariance of distress, as measured by BDI-II, STAI-Trait, and SCL-90-R-Somatization, across Turkey and U.S.A. were investigated. Based on previous findings, it was hypothesized that the factor structure of depression, anxiety, and somatization would vary across cultures (13). According to the results of the main analysis in this study the Three Factor Covariance model had adequate fit for both the Turkish and the U.S.A. data. Thus, the first hypothesis was not confirmed. The factor loadings and factor variances and covariances varied significantly across samples. Thus, the second hypothesis was confirmed. Although the same factor structures represented the constructs across cultures, these constructs may not mean the same thing across these cultures. Thus, it can be concluded that the relationship between anxiety, depression, and somatization is not strong enough to warrant a single factor for the Turkish students, but there still are significant differences between the Turkish and the U.S.A. students in their experience of depression, somatization, and anxiety.

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