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International positive and negative affect schedule short-form (I-PANAS-SF): testing for factorial invariance across cultures

Jahanvash Karim[a] *, Robert Weisz[b], Shafiq Ur Rehman[c]

[a]*CERGAL, IAE d'Aix-en-Provence, Université Paul Cézanne, Aix-en-Provence, France.*
[b]*CERGAL, IAE d'Aix-en-Provence, Université Paul Cézanne, Aix-en-Provence, France*
[c]*QuAID-e-Azam University Islamabad, Pakistan*

Abstract

This study examined the factorial invariance of the International Positive and Negative Affect Schedule Short-Form (I-PANAS-SF) (Thompson, 2007) across two cultures (i.e., France and Pakistan). The I-PANAS-SF is composed of two ten-item mood scales: one to measure positive affectivity and the other to measure negativity affectivity. Participants of this study included 423 university students from two national cultures: 111 from city of Aix-en-Provence, France (49 males, 62 females), and 310 from city of Quetta in the province of Balochistan, Pakistan (168 males and 142 females). Multigroup structural equation models were proposed in order to compare the factor structure of the I-PANAS-SF across two cultures. Results indicated that university students across the two cultural groups interpreted I-PANAS-SF 10 items in a similar manner regardless of their cultural backgrounds.

Keywords: Affectivity;cross-cultural; factorial invariance;

1. Introduction

Over the past 30 years, subjective well-being (SWB) has received considerable attention within scientific literature. The research of SWB aims to study and understand what makes people feel in relation to their own values and standards (Pavot & Diener, 1993). Research has identified two broad aspects of subjective well-being: the affective component and the cognitive component (Diener, Emmons, Larsen, & Griffin, 1985; Lucas, Diener, & Suh, 1996; Pavot & Diener, 1993).

The cognitive aspect of SWB, operational as satisfaction with life, refers to a cognitive judgment of life in which individuals compare their life circumstances with a self-imposed standard (Diener et al., 1985). In other words, individuals will report high satisfaction with life if their perceived life circumstances are in line with their own standards. On the other hand, the affective aspect of SWB refers to the emotional component whereby levels of positive affect (PA) and negative affect (PA) are used to indicate the level of SWB. PA refers to tendency of experiencing good feelings. Conversely, NA has been defined as the degree to which individuals exhibit negative emotionality, manifest high level of psychological symptoms, and react negatively to stressful situations (Watson, Clark, & Tellegen, 1988).

However, despite the rather large literature concerning subjective well-being, the vast majority of studies concerning development and validation of subjective well-being scales have been done in the Western countries.

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Hence, a major limitation in this literature is its decidedly Western focus. The aim of this research was to assess the psychometric properties of the Thompson's (2007) 10-item International Positive and Negative Affect Schedule Short-Form (I-PANAS-SF) in a cross-cultural comparative context involving the collectivist Pakistani (Eastern culture) and the individualist French (Western culture) university students.

1.1. I-PANAS-SF

Thompson (2007) developed the International Positive and Negative Affect Schedule Short-Form (I-PANAS-SF).The I-PANAS is multi-item scale developed as a measure of the affective component of SWB. The ten items are derived from the original 20 PANAS (Watson et al., 1988) item pool. The five positive affective states are: active, determined, attentive, inspired, and alert. The five negative affective states are: afraid, nervous, upset, hostile, and ashamed. Respondents are asked to rate these positive and negative adjectives according to the extent to which each describes the way they have felt during a specified time. Thompson (2007) investigated the cross-sample stability, internal reliability, and convergent and criterion-related validities of the scale and found the scale to be psychometrically acceptable.

1.2. Structural equivalence

An important research question that has yet to be systematically examined is whether the I-PANAS-SF construct generalizes across different cultures. The evidence for structural equivalence can be established by replicating the factor structure of the I-PANAS-SF and demonstrating that the I-PANAS-SF possesses robust internal reliability across cultures. Cultural differences can affect psychological constructs of human behavior (Hofstede, 2001). Psychological tests are linked to cultural contexts in which these tests are used and interpreted. In this nexus, when tests are transported from one culture to another the comparability of psychological measurements across different cultures should be investigated before reaching any final conclusion. A lack of evidence for measurement invariance across cultures could point toward bias at the construct level and obviates the ability of the measure to be used in comparisons among different cultural groups. For instance, one of the major objectives of any cross-cultural study is to compare the mean level of PA and/or NA across cultural groups. Interpretation of the mean differences may be problematic unless the underlying constructs of PA and NA are same or invariant across cultural groups. Therefore, if the I-PANAS-SF is used to compare mean differences across cultures, the I-PANAS-SF should have the same meaning or same factor structure across cultural groups.

Individualism-Collectivism is a major dimension of cultural variable postulated by many theorists (e.g., Hofstede, 1980; 2001). This dimension focuses on the degree a society reinforces individual or collective actions, achievements, and interpersonal relationships. Collectivism typifies societies of a more collective nature, close ties between individuals, collective goals and dependence on groups; while individualistic cultures stress individual goals and independence. For this study, structural invariance of the I-PANAS-SF was tested across French and Pakistani cultures because cross-cultural research predominantly involves the comparison of Eastern and Western cultures. According to Hofstede's (1980) cultural dimensions, Pakistan is a typical representative of the classical Eastern culture. France is considered as a prototype of the classical Western culture. According to Hofstede's rankings (see www.geert-hofstede.com) Pakistan ranks 14 on individualism which is much lower than the world average of 50, reflecting an orientation towards a collectivistic culture. France ranks 71, indicating a society with more individualistic attitudes.

2. Method

2.1. Participants

Participants of this study included 423 university students from two national cultures: 111 from city of Aix-en-Provence, France (49 males, 62 females), and 312 from city of Quetta in the province of Balochistan, Pakistan (161

males and 151 females).The average age of the participants was 24.5 (SD= 3.6) for French respondents, and 25.8 (SD= 4.3) for Pakistani respondents. All participants were treated in accordance with the "Ethical principles of Psychologists and Code of Conduct" (American Psychological Association, 2002). As all participants (in both cultures) indicated that they had good command of English and were able to complete the instruments in the English language, they completed the English version of the instrument.

2.2. Measures

I-PANAS-SF (Thompson, 2007) is composed of two ten-item mood scales: one to measure positive affectivity and the other to measure negativity affectivity. The higher scores on both PA and NA items indicate the tendency to experience a positive and negative mood. Respondents were requested to rate the statement on a 5-point scale (*not at all* to *extremely*) by comparing themselves during the past 2 weeks with their 'usual selves'. In this study, the positive and negative affect parts of PANAS for overall sample had acceptable internal consistency (PA: α = .75, 95% CI: .71 -.78, *M* = 3.82, *SD* = .67; NA: α = .80, 95% CI: .76 -.82, *M* = 1.91, *SD* = .77).

2.3. Analyses

Tests to measure invariance between countries were based on the analysis of covariance structure models using Amos 16 (Arbuckle, 2007). Prior to invariance analysis, two-factor baseline model (Thompson, 2007) was tested separately for each sub-sample. The structure reported by (Thompson, 2007) was used as the hypothesized baseline model. For the 10-item short I-PANAS-SF, the baseline model specified five positive affect items (active, determined, attentive, inspired, and alert) on the first factor, and five negative affect items (afraid, nervous, upset, hostile, and ashamed) on the second factor. This specifies that the variances/covariances of the observed items can be explained in terms of two underlying latent variables, that is, PA and NA, and uncorrelated unique variances or measurement error. If the two factor model cannot be rejected in each group increasingly restrictive constraints can be imposed on the model.

Next invariance was tested on six levels of nested models. Each model had more constraints than the previous one. The first level was configured invariance. In terms of factorial invariance, it implies that the items comprising the measurement instrument should exhibit the same configuration of salient and non-salient factor loadings across different groups (Steenkamp & Baumgartner, 1998). In other words, it is assumed that the overall factor pattern is same across groups. The second level is testing for weak factorial invariance, also called metric invariance. In contrast to configured invariance, metric invariance provides for a stronger test of invariance by introducing the concept of equal metrics (equal loadings) across groups (Steenkamp & Baumgartner, 1998). Metric invariance was tested by constraining the loadings to be same across groups ($\Lambda_1 = \Lambda_2$). This tests the hypothesis that regression coefficients relating the latent variable to the observed variables for group 1 (Λ_1) is equal to that for group 2 (Λ_2). If the factor loadings constrained model (metric invariance) was acceptable then unique variances of each item were constrained to be equal across groups ($\Theta_1 = \Theta_2$). This tests the hypothesis that, in addition to invariant factor loadings, the unique variances for items are same across each group or the items are equally reliable across groups. Next, if factor loadings and unique variances of each item were equal across groups, factor covariance's were constrained to be equal across groups [! = ! (j = 1, ….., m; k = 1, …., (j – 1))]. If factor covariances are invariant, the correlations between the latent variables are invariant across groups (Steenkamp & Baumgartner, 1998).

All models were tested using covariance matrices and each model was estimated using the maximum likelihood method. For the purpose of testing the hypothesis of invariance during each step, the chi-square difference ($\Delta\chi^2$) was tested between nested models. The model fits were evaluated by means of following indices: the relative discrepancy index (CMIN/*df*; a value of 3 or lower represents a good fit), the Comparative Fit Index (CFI: > .90 acceptable, > .95 excellent; Bentler & Bonett, 1980), and the Root Mean Square Error of approximation (RMSEA; < .08 acceptable, < .05 excellent; Brown & Cudeck, 1993).

3. Results

Table 1 presents the CFA (Arbuckle, 2007) results based on I-PANAS-SF items across countries. The proposed two-factor model fit well for both French and Pakistani samples. Thus, a two-factor model served as a base line model for subsequent multi-sample analyses (Figure 1).

Next, invariance across cultures was tested on four levels of nested models. Each model had more constraints than the previous one (Table 1). First, a multi-sample analysis with the unconstrained model (Model 1: configural invariance) showed an acceptable baseline model for both French and Pakistani samples. This showed that Pakistani participants and French participants shared the same I-PANAS underlying factor pattern and that corresponding adjectives loaded on the same factors across cultures. Then, to test the invariance of the factor loadings (metric invariance) across cultures, factor loadings were constrained to be equal across the two groups (M2). The results revealed that this constrained model fit the data well. The chi-square difference test between configural invariant model (M1) and metric invariant model (M2) was significant ($\Delta\chi2$ =48.93, df =8, $p < .001$), suggesting that factor loadings of both groups were not invariant. After relaxing the three constraints of λactive, λupset, and λhostile , model fit indices improved (model 2.1). The $\chi2$ difference between model 2.1 and 1 was not significant ($\Delta\chi2$ =6.85, df =5, p = .23). Thus partial metric invariance (with three out of ten invariance constraints relaxed) is supported. Next, in addition to the factor loadings, unique variances of each item were constrained to be equal across the groups (M3). The chi-square difference test between this model and M2 was significant ($\Delta\chi2$ =72.31, df =10, $p < .001$), suggesting that models are not completely invariant once setting equal error variances. Subsequently, relaxing the constraints on error variances of Θactive, Θafraid, Θnervous, and Θupset (model 3.1) yielded a substantial and significant improvement in the model fit. The $\chi2$ difference between model 3.1 and 2.1 was not significant ($\Delta\chi2$ =12.34, df =6, p = .07). Finally, besides the constrained mentioned, factor covariance between latent factors PA and NA were also constrained to be equal across the two groups (M4). The $\chi2$ difference between model 4 and 3.1 was not significant ($\Delta\chi2$ =2.40, df =1, p = .12). Therefore, the hypothesis of invariant covariance between cultures was tenable. In sum, multi-sample CFA analyses revealed that, with few exceptions, the factor loadings, unique variances, and factor covariances were invariant across cultures.

4. Discussion

The main purpose of this study was to evaluate the two-factor structure of the I-PANAS-SF (Thompson, 2007) among university students and to test the measurement invariance of the scale across countries. To my knowledge, this study was first to provide evidence of the dimensional and configural invariance of the I-PANAS-SF across cultures. Factorial invariance is an essential component of the iterative process of demonstrating the measurement equivalence of latent constructs across groups (Limbers, Newman, & Varni, 2009) and is often not presented in cross-national research in behavioral sciences, and hence casts doubts on the theory and conclusions (Steenkamp & Baumgartner, 1998).

Regarding measurement invariance across countries, with few exceptions, a two-factor I-PANAS-SF measurement model was an acceptable description of the data for both French and Pakistan samples. The regression coefficients relating the latent variable PA with the observed variable active and latent variable NA with the observed variables upset and hostile are not equal for French and Pakistani samples. The error variances of these variables are also different between French and Pakistani samples. Although we can assume that the same theoretical constructs are being measured, but the relative importance of the observed variables active, afraid, nervous and upset are not same across countries. Since these items are not invariant across cultures, a caution is warranted when combining the scores across countries. The differences in correlation with other variables may be due to the fact these variant items function differently. Atienza, Balaguer and Garcia-Merita (2003) assert that, “the failure of a psychological measurement to be equal across groups may indicate that the language used in the items or the values and aspirations in the items do not validly apply to different groups” (p. 1260). Hence, further research is

warranted to better delineate the possible cultural influences regarding these invariant items across other cultures. Finally, subsequent analyses show that factor covariances are invariant cross-culturally.

Overall, these findings are more indicative of the universality of the affectivity as a construct across cultures. With few exceptions, the meaning of the I-PANAS-SF 12 items or adjectives and factors are generally identical across cultures. Moreover, the results of this study provided South Asian and French researchers with a brief and easy to administer and interpret affectivity instrument. This instrument can be used for the purpose of exploring underlying conceptual models of affectivity, as well as, academicians and practitioners in both countries may use I-PANAS-SF for counseling.

The present study lacks longitudinal data that would allow the examination of I-PANAS-SF (Thompson, 2007) factor structure across time. "Longitudinal data would provide information on the stability of the relationship between the factors and the variables by which the factors were measured over time. "The demonstration of, factorial invariance is important in representing valid within-group changes and reliable change process over time" (Nguyen, Kitner-Triolo, Evans, & Zonderman, 2004, p .185). In addition, respondents in this study were university students, which raise a number of methodological issues concerning the external validity of the findings in that these findings do not represent all age categories (Wintre, North, & Sugar, 2001). University students may experience different levels of PA and NA, therefore it is important to examine the factorial invariance of I-PANAS-SF across various age groups.

Table 1. Multi-Sample Goodness-of-Fit indices for I-PANAS-SF Across Cultures

	Model	χ^2	df	χ^2/df	CFI	RMSEA
Phase I : Baseline model fit for each country						
	France	48.68	34	1.43	.95	.063 (.04-.10)
	Pakistan	99.67	34	2.93	.92	.075 (.061-.097)
Phase II : Factor invariance across countries						
M1	Configural invariance	148.41	68	2.18	.933	.053 (.041-.065)
M2	Metric invariance	197.34	76	2.54	.899	.062 (.041-.065)
	$\Delta\chi^2$ M2 vs. M1	48.93***	8			
M2.1	λ_{active}, λ_{upset}, $\lambda_{hostile}$ free	155.26	73	2.12	.932	.052 (.040-.063)
	$\Delta\chi^2$ M2.1 vs. M1	6.85	5			
M3	Invariant uniqueness	227.57	83	2.74	.88	.064 (.054-.074)
	$\Delta\chi^2$ M3 vs. M2.1	72.31***	10			
M3.1	Θ_{active}, Θ_{afraid}, Θ_{upset}, $\Theta_{nervous}$ free	167.6	79	2.12	.926	.052(.041-.062)
	$\Delta\chi^2$ M3.1 vs. M2.1	12.34	6			
M4	Invariant factor covariances	170.2	80	2.11	.924	.051 (.041-.065)
	$\Delta\chi^2$ M5 vs. M4	2.40	1			

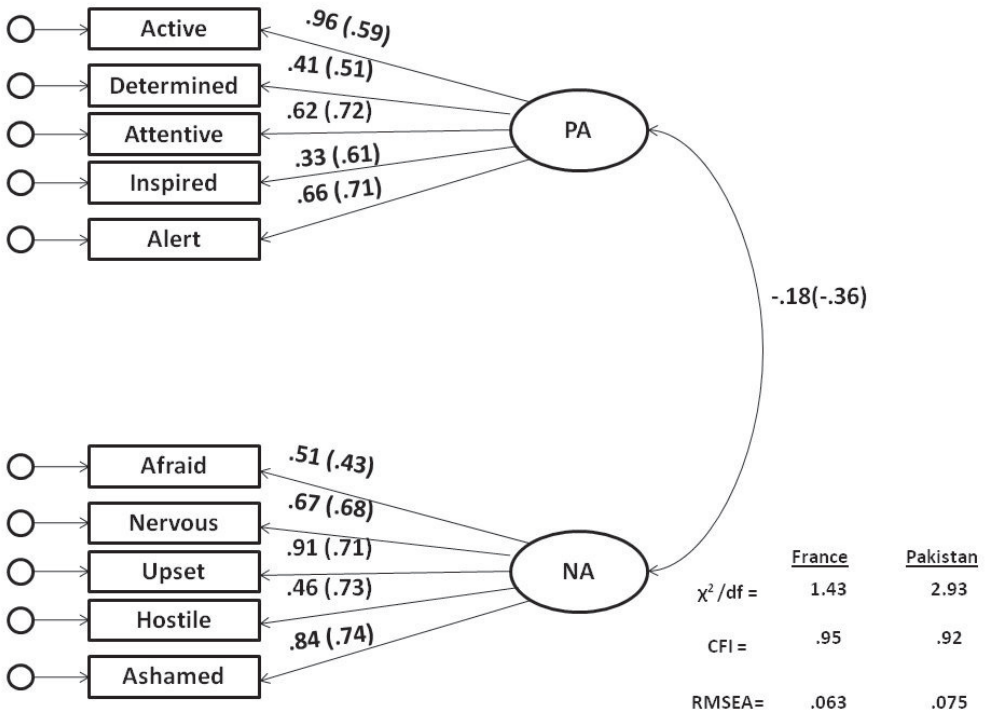

Figure 1. Baseline model fit for each culture. Values in parenthesis represent values for Pakistani sample.

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