

Examining the Factor Structure of the Positive and Negative Affect Schedule (PANAS) in a Multiethnic Sample of Adolescents

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Abstract

The psychometric properties of the Positive and Negative Affect Schedule were examined in a multiethnic sample of adolescents. Results from confirmatory factor analyses indicated that the original two-factor model did not adequately fit the data. Exploratory factor analyses revealed that four items were not pure markers of the factors.

Keywords

psychometrics, positive affect, negative affect, ethnic minority

Historically, individuals of European descent have been the dominant culture within the United States. However, the cultural makeup of the United States is progressively changing. As the United States becomes more diverse, multiethnic and cross-cultural research continues to burgeon and establishing culturally sensitive measures is becoming increasingly important. Unfortunately, there are few psychological measures that have demonstrated cultural validity. Thus, the majority of the standardized personality measures that are frequently used in research conducted within the United States are validated and normed on predominately Caucasian samples (Allen & Walsh, 2000). One example of a personality measure that is widely used within different ethnic and age groups is the Positive and Negative Affect Schedule (PANAS; Brondolo et al., 2008; Grünh, Kotter-Grünh, & Röcke, 2010; Talbot, McGlinchey, Kaplan, Dahl, & Harvey, 2010). Despite its broad use, no formal validation of this instrument has been conducted with an ethnic minority adolescent sample.

Development of the PANAS

The PANAS is a 20-item self-report measure of positive affect (PA) and negative affect (NA) developed by Watson, Clark, and Tellegen (1988). PA and NA are the most widely used dimensions in studies of affective structure. Watson et al. recognized the need for a brief, but reliable and valid, measure of PA and NA that would be easy to administer. Watson et al. defined PA as the extent to which a person feels enthusiastic, active, and alert. PA was conceptualized as a continuum with high PA reflecting high energy, full concentration, and pleasurable engagement, whereas sadness and lethargy are indicative of low PA. Conversely,

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NA was conceptualized as a general dimension of subjective distress and unpleasurable engagement that includes feelings of anger, contempt, disgust, guilt, fear, and nervousness. Low NA presents itself as a state of calmness and serenity. Watson et al. also conceptualized PA and NA as two distinct factors and proposed that they should be represented as orthogonal dimensions. Although some previous research found PA and NA to be correlated factors (Brenner, 1975; Diener & Emmons, 1984; Kammann, Christie, Irwin, & Dixon, 1979), Watson et al. (1988) disagreed and attributed the inconsistent findings to the poor development of previous measures of PA and NA (i.e., lack of reliability and validity). Therefore, the primary objective in developing the PANAS was to select relatively pure markers of either PA or NA, thus eliminating overlapping content.

The PANAS was developed using a sample of predominately Caucasian college undergraduates and employees from a private university. Six different samples (N s ranging from 586 to 1,002) were asked to rate how applicable various descriptors were of their mood state on a 5-point scale ranging from 1 (*very slightly or not at all*) to 5 (*very much*). Each sample rated their mood on one of six different time frames, which included the following: (a) right now, (b) today, (c) during, the past few days, (d) during the past few weeks, (e) during the past year, and (f) in general. Participants were also administered several other measures of constructs (i.e., anxiety, depression, and general psychological dysfunction) that were theoretically related to the PA and NA dimensions. The PANAS was re-administered to 101 students from the original sample and achieved adequate internal consistency (ranging from .86 to .90 for PA and from .84 to .87 for NA) and test-retest reliability coefficients (ranging from .47 to .68 for PA and from .39 to .71 for NA). An exploratory factor analysis (EFA) with varimax rotation was performed on each data set to determine the underlying factor structure of the PANAS. EFAs revealed that most of the common variance (ranging from 62.8% to 68.7%) in all 20 items was accounted

for by the PA and NA factors and that all items had strong primary loadings and weak secondary loadings on their hypothesized factors. The correlations between the NA and PA scales were low, ranging from $-.12$ to $-.23$. The external validity of the PANAS was confirmed by examining the correlations between the PANAS scales and measures of related constructs such as anxiety (NA $r = .35$ and PA $r = -.51$), depression (NA $r = .58$ and PA $r = -.36$), and distress (NA $r = .74$ and PA $r = -.19$).

Although some argue that the PANAS has excellent psychometric properties few have examined and/or attempted to confirm the original factor structure. Thus far, the PANAS has been evaluated in a variety of predominantly Caucasian populations (Crawford & Henry, 2004; Crocker, 1997; Laurent et al., 1999). There have also been several international studies that have examined the factor structure of translated versions of the PANAS (Engelen, De Peuter, Victoir, Van Diest, & Van Den Bergh, 2006; Terracciano, McCrae & Costa, 2003). Results reported by Laurent et al. (1999) as well as an additional study using a sample of adolescents (Crocker, 1997) provided support for a PANAS model with two independent factors, similar to the original model proposed by Watson et al. (1988). To further explore the independence of the PA and NA factors, Crawford and Henry (2004) evaluated the psychometric properties of the PANAS using 1,002 nonclinical adults from the United Kingdom. More specifically, they attempted to resolve some of the inconsistencies regarding the factor structure of the PANAS by sequentially testing measurement models with confirmatory factor analysis (CFA). The first model specified a single factor for the PANAS, which yielded poor fit. A second two-factor orthogonal model was specified that reflected the original model with two, independent PA and NA factors hypothesized by Watson et al. (1988). Although the two-factor orthogonal model improved model fit, it was not tenable. Next, a less restrictive model was specified and allowed the PA and NA factors to covary, which

significantly improved model fit. Further support for this model with oblique PA and NA factors was found using Dutch and Italian versions of the PANAS by Engelen et al. (2006) and Terracciano et al. (2003).

Researchers have also noted that the item content is redundant for several items within each PANAS scale (Crawford & Henry, 2004; Crocker, 1997). Empirical support for this has been found in studies that revealed a substantial improvement in model fit by allowing item-level error terms to covary using samples of American adolescents and adults as well as Dutch-speaking samples of adults (Crawford & Henry, 2004; Crocker, 1997; Engelen et al., 2006). The specification of covariances between item-level error terms is often accepted when it can be substantively justified (Byrne, 2005). In this case, each item group identified had considerable content overlap, which required further specification to account for method variance. Thus, it was concluded that the best-fitting PANAS model was represented by two distinct but moderately negatively correlated factors (Crawford & Henry, 2004) rather than independent PA and NA factors as the hypothesized by Watson et al. (1988).

It is important to recognize that instruments normed on majority populations should not be haphazardly applied to minority populations. Cultural factors such as acculturation, cultural experience, and language proficiency may influence the way a person understands and scores on a test (Arellano & Padilla, 1996). Researchers using assessment tools in different demographic groups should ensure that they are reliable and valid within those groups; otherwise factors such as test bias and nonequivalence could affect accuracy of their findings.

The Present Study

Although the utility of the PANAS has been examined in previous research, several questions remain regarding its factor structure. First, can the original factor structure proposed by Watson et al. (1988) be replicated? Second, it is unclear whether or not the PA and

NA dimensions should be considered independent or moderately correlated constructs. The present study attempted to replicate the PANAS factor structure proposed by Watson et al., which specified two independent and orthogonal dimensions (i.e., PA and NA) using CFA. Recent findings have indicated that the initial model specified by Watson et al. was too restrictive with respect to the interfactor correlations. Thus, it is also important to test a less restrictive model with oblique factors in addition to the nested model proposed by Watson et al. Third, additional research is needed to validate the content domain encompassed by the items of each dimension. Some researchers have suggested that method variance is shared by PA and NA items with similar or redundant content. Moreover, previous researchers found that model fit was improved by specifying covariation of item uniquenesses (Crawford & Henry, 2004). Thus, the present study will attempt to replicate these findings by specifying a similar model. Finally, there has been a lack of empirical evidence to support the validation of the PANAS across diverse populations. The present study attempted to extend the findings of previous researchers by examining the factor structure of the PANAS in an ethnic minority college student sample.

Method

Participants

Participants were recruited from summer residential programs at a large western university. These programs are aimed at serving low-income, high school students from historically underrepresented groups. It was a requirement of the programs that at least two thirds of all participating students be both low-income and *potentially* first-generation college students, whereas the remaining one third could be one or the other. Thus, the sample can be described as primarily of low socioeconomic status. The final sample was comprised of 318 high school students. The majority of the sample was Hispanic (42.8%, $n = 134$) or Asian American (36.1%, $n = 113$), with

smaller percentages of other minority groups: African Americans (11.2%, $n = 35$), Middle Easterners (5.8%, $n = 18$), Native Americans (1.6%, $n = 5$), and biracial students (1%, $n = 3$). The remaining 1.5% ($n = 5$) of participants did not specify their ethnicity. The gender breakdown was approximately equivalent (51% male, 49% female), and the age of the sample ranged from 14 to 18 years ($M = 15.7$ years, $SD = .76$).

Measures

The Positive and Negative Affect Schedule. PA and NA were assessed using the PANAS (see Watson et al., 1988), which consists of two 10-item mood scales. Participants were asked to rate the extent to which they are experiencing each particular affect at this moment. Items from this measure were rated on a 5-point scale that included the following: *very slightly or not at all* (1), *a little* (2), *moderately* (3), *quite a bit* (4), and *very much* (5). Reliability values will be presented in the "Results" section.

Validity measures. Validity measures were selected to be consistent with those used in the original psychometric article of Watson et al. (1988) and psychometric research in positive psychology (e.g., Snyder et al., 1996; Snyder et al., 1997). To this end, each participant completed additional measures to assess the convergent and discriminant validity of the PANAS. Depressive symptoms were measured using the Children's Depression Inventory (Kovacs, 1992). Using depressive symptom levels for the past 2 weeks in adolescents, scores on this scale were highly reliable ($\alpha = .95$). The Children's Dispositional Hope Scale (C-DHS; Snyder et al., 1997) is a six-item scale used to measure Agency (three items measuring self-efficacy of problem solving) and Pathways (three items measuring the ability to produce viable solutions to solve a problem). The current study used the total scale score for the C-DHS rather than the two subscales. The C-DHS showed adequate reliability, yielding an α of .90. Stress was assessed by asking the participant to describe a stressful event and then rate

how stressful the event was based on a 5-point rating scale (1 = *very slightly* to 5 = *extremely*).

Procedure

Because the participants were high school students, and most of them minors, parental consent was obtained, as well as assent from the students on the first day of the summer program. The following week the participants completed the measures in a large classroom setting.

CFA Procedures

In assessing the factorial validity of the original PANAS, a CFA was conducted. To be consistent with Watson et al. (1988), a two-factor model of the PANAS was tested with the current sample. In this model, direct paths from each affect factor (i.e., PA and NA) to their respective items were specified. The interfactor correlation between these latent variables was also specified. A second model was tested to account for shared method variance that might exist among certain items of the PANAS. Several items represented overlapping content categories beyond the general dimensions of PA and NA (e.g., attentive and alert both fall within the original content category of "attentive") but did not comprise stable factors. Covariation among the item uniqueness terms would reflect measurement or method variance in this regard (see Crawford & Henry, 2004; Merz & Roesch, 2011).

To determine overall model fit, multiple measures were used: (a) the Satorra-Bentler scaled χ^2 (S-B χ^2 ; Satorra & Bentler, 1988), a statistical test of model fit when data are multivariately nonnormal; (b) the comparative fit index (CFI; Bentler, 1990), with values greater than .90 indicating reasonable model fit; and (c) the root mean square error of approximation (RMSEA; Steiger, 1990), with values less than .08 indicating reasonable model fit. The S-B χ^2 was used because nonnormal data were expected. A significance level of .05 was used in evaluating the statistical significance of individual model parameters (e.g., factor loadings and interfactor correlations).

Results

The means for individual sample items ranged from 1.64 to 3.61 (*SDs* ranged from 1.17 to 1.46). The univariate distributions for the individual items resulted in a slight negative or positive skew depending on the PANAS item. In addition, preliminary data analysis also revealed significant multivariate kurtosis for the current sample (normalized Mardia's coefficient = 18.51). Because the assumption of multivariate normality was violated, we used the $S\text{-}B\chi^2$.

CFAs on the Original PANAS

For the original 20-item measure, the two-factor model did not fit well, $S\text{-}B\chi^2(169, N = 313) = 619.37, p < .05, CFI = .78, RMSEA = .10, 90\%$ confidence interval (CI) for RMSEA = .010, .11. Thus, a second CFA was conducted on the two-factor structure, but in this model correlated error terms representing content categories were allowed. This two-factor model also did not fit well, $S\text{-}B\chi^2(156, N = 313) = 579.13, p < .05, CFI = .80, RMSEA = .10, 90\%$ CI for RMSEA = .010, .11.

EFA Examining the Dimensionality of the Original PANAS

Because of the relatively poor model fit from the CFAs, EFA based on the common factor model with direct oblimin rotation was conducted on the items of the original PANAS to further explore the dimensionality of this measure. The variance accounted for by the solution, the variance accounted for by each individual factor, and the interpretability of the factors were all evaluated to determine the initial plausibility of the factor structure. Furthermore, a modified version of parallel analysis was used (see Glorfeld, 1995) to determine the number of factors.

An initial two-factor solution accounted for 42.40% of variance in the solution. However (a) three items had high secondary factor loadings ($>.25$) and (b) one item had a communality estimate that was particularly low ($=.08$).

Because our goal was to develop a relatively pure measure of PA and NA in this minority adolescent sample, the three items with relatively high cross-loadings (i.e., proud, alert, jittery) as well as the item with the low communality estimate (i.e., distressed) were removed. The remaining 16 items were then subjected to further analysis. The analysis of these 16 items resulted in a two-factor solution that accounted for 42.39% of the variance. The percentage of variance accounted for and the eigenvalues for the rotated factors were the following: Factor 1 (PA) accounted for 26.7% of the variance (eigenvalue = 5.11) and Factor 2 (NA) accounted for 17.32% of the variance (eigenvalue = 3.30). Both Factors 1 and 2 were each composed of eight items. Moreover, subscale scores were reliable ($\alpha = .88$ for PA and $\alpha = .85$ for NA). Parallel analysis was used to validate the two-factor solution. Parallel analysis identified two factors when the eigenvalues from this EFA were compared with the eigenvalues from the randomly generated factors: (a) Factor 1: 5.27 versus 1.54 and (b) Factor 2: 3.32 versus 1.43. Moreover, the total variance accounted for by this solution was appreciable (64.3%), and each factor accounted for a satisfactory amount of variance postrotation (see Table 1). Moreover, all communality values exceeded .20. The correlation between the PA and NA factors was significant and negative ($r = -.18, p < .05$), indicating that higher PA is weakly associated with lower NA.

Correlations With Validity Measures

To establish the convergent and discriminant validity of the obtained scores from the revised measure, the factors of the 16-item PANAS were correlated with the measures of depressive symptoms, stress, and hope. For comparative purposes, the correlations between the original 20-item PANAS ($r_{\text{PANAS-20}}$) and the validity measures are also reported. All correlations presented below are statistically significant at a significance level of .05; each statistical test is based on 311 degrees of freedom. The PA factor was significantly and negatively

Table 1. Factor Pattern/Structure Coefficients, Communalities, Trace Values, and Percentage of Variance Accounted for by Each Factor

Item	PA	NA	h^2	$M (SD)$
1. Enthusiasm	.76 (.77)		.56	2.86 (1.36)
2. Inspired	.73 (.73)		.54	3.17 (1.40)
3. Active	.72 (.74)		.56	3.29 (1.45)
4. Excited	.71 (.71)		.51	3.04 (1.36)
5. Strong	.67 (.72)		.56	3.55 (1.33)
6. Attention	.66 (.63)		.42	3.28 (1.33)
7. Interested	.66 (.63)		.41	3.12 (1.29)
8. Determined	.57 (.56)		.32	3.61 (1.33)
9. Scared		.75 (.74)	.54	1.71 (1.17)
10. Afraid		.74 (.73)	.54	1.68 (1.24)
11. Guilty		.71 (.71)	.50	1.71 (1.25)
12. Nervous		.67 (.64)	.43	2.08 (1.41)
13. Upset		.66 (.70)	.49	2.11 (1.40)
14. Ashamed		.64 (.65)	.41	1.64 (1.17)
15. Irritable		.50 (.54)	.31	2.17 (1.32)
16. Hostile		.46 (.47)	.22	1.77 (1.75)
Percentage of variance	28.7	17.32		

Note: PA = Positive affect; NA = negative affect; h^2 = communality coefficient. Pattern matrix coefficients are presented without parentheses and structure matrix coefficients are presented within parentheses. Percentage of variance accounted for by each factor is postrotation.

correlated with stress ($r = -.29$, $r_{\text{PANAS-20}} = -.21$) and depression ($r = -.20$, $r_{\text{PANAS-20}} = -.17$) and positively correlated with hope ($r = .21$, $r_{\text{PANAS-20}} = .21$). The NA factor was significantly and positively correlated with stress ($r = .39$, $r_{\text{PANAS-20}} = .33$) and depression ($r = .34$, $r_{\text{PANAS-20}} = .35$) and negatively correlated with hope ($r = -.22$, $r_{\text{PANAS-20}} = -.19$).

Reliabilities/Correlations With Validity Measures (Within Ethnic Group)

The revised 16-item PANAS scale showed adequate reliability within the African American, Asian American, and Hispanic groups (PA: $\alpha = .90$, $.84$, and $.90$, respectively; NA: $\alpha = .82$, $.81$, and $.87$, respectively). To establish convergent and discriminant validity within the African American, Asian American, and Hispanic groups, the factors of the 16-item PANAS were correlated with the measures of depressive symptoms, stress, and hope using a significance value of $.05$; the degrees

of freedom for these statistical tests were 132 for Hispanics, 33 for African Americans, and 111 for Asian Americans.

For Hispanics, the PA factor was significantly and negatively correlated with stress ($r = -.29$, $p < .05$; $r_{\text{PANAS-20}} = -.27$, $p < .05$) and depression ($r = -.32$, $p < .05$; $r_{\text{PANAS-20}} = -.29$, $p < .05$) and positively correlated with hope ($r = .40$, $p < .05$; $r_{\text{PANAS-20}} = .38$, $p < .05$). The NA factor was significantly and positively correlated with stress ($r = .29$, $p < .05$; $r_{\text{PANAS-20}} = .26$, $p < .05$) and depression ($r = .37$, $p < .05$; $r_{\text{PANAS-20}} = .38$, $p < .05$) and negatively correlated with hope ($r = -.24$, $p < .05$; $r_{\text{PANAS-20}} = -.20$, $p < .05$).

For African Americans, the PA factor was significantly and negatively correlated with stress ($r = -.31$, $p < .05$; $r_{\text{PANAS-20}} = -.25$, $p > .05$) and depression ($r = -.30$, $p < .05$; $r_{\text{PANAS-20}} = -.25$, $p > .05$) and positively correlated with hope ($r = .30$, $p < .05$; $r_{\text{PANAS-20}} = .21$, $p > .05$). The NA factor was significantly and positively correlated with stress ($r = .38$, $p < .05$; $r_{\text{PANAS-20}} = .33$, $p < .05$) and

depression ($r = .42, p < .05$; $r_{\text{PANAS-20}} = .42, p < .05$) and negatively correlated with hope ($r = -.32, p < .05$; $r_{\text{PANAS-20}} = -.26, p > .05$).

For Asians Americans, the PA factor was *not* significantly correlated with stress ($r = -.05, p > .05$; $r_{\text{PANAS-20}} = -.05, p > .05$), depression ($r = -.01, p > .05$; $r_{\text{PANAS-20}} = -.01, p > .05$), or with hope ($r = .04, p > .05$; $r_{\text{PANAS-20}} = .05, p > .05$). However, the NA factor was significantly and positively correlated with stress ($r = .31, p < .05$; $r_{\text{PANAS-20}} = .35, p < .05$) and depression ($r = .22, p < .05$; $r_{\text{PANAS-20}} = .28, p < .05$) but not with hope ($r = -.16, p > .05$; $r_{\text{PANAS-20}} = -.13, p > .05$).

Discussion

The present study examined the factorial validity of the PANAS in an ethnically diverse sample of multiethnic adolescents. Although the original PANAS model proposed by Watson et al. (1988) did not adequately fit the data, modifications were made to improve the psychometric properties for the target sample. The present study found evidence for the reliability (i.e., internal consistency) and validity (i.e., convergent and discriminant) of the PANAS in the overall sample as well as some ethnic groups after the removal of four items.

The first aim was to confirm the original PANAS model proposed by Watson et al. (1988). CFA revealed that the original PANAS model did not adequately fit the data. This poor model fit was caused by one item that was not strongly related to either factor and three items that were related to both factors. These findings were supported by an EFA of the 20 items; these items were removed and a subsequent EFA was conducted. Two factors were identified by the remaining 16 items; one half represented a PA factor whereas the other half represented an NA factor. Thus, although the original factor structure proposed by Watson et al. could not be confirmed in a sample of ethnic minority adolescents, it was determined that a two-factor model best represented the data.

The four items that were removed were descriptors indicating how much individuals

were feeling proud, alert, jittery, and distressed. Of the four items, three (i.e., proud, alert, and jittery) were related to both the PA and NA factors. The proud item was more strongly related to the PA factor, whereas it had a relatively smaller and negative association with the NA factor. Thus, it appears that ethnic minority adolescents may conceptualize feeling proud as particularly indicative of less NA. The alert and jittery items both had positive primary and secondary loadings, which indicate that responses to these items were inconsistent with the proposed factor structure. It is possible that this inconsistency could be the result of the participants' unfamiliarity with the descriptors. More specifically, adolescents may be less likely to describe themselves as feeling alert or jittery and may not conceptualize either of these descriptors as more strongly representative of feeling positive or negative. It is important to note that Laurent et al. (1999) also found that the alert item did not work well in their sample. In contrast, the distressed item was not related to either PA or NA. Although it is likely that ethnic minority adolescents are familiar with the concept of stress, a lack of familiarity with the descriptor distressed may have affected their responses to this item in relation to the other PA and NA items.

Another aim of the present study was to examine whether or not PA and NA should be represented as orthogonal factors, as proposed by Watson et al. (1988), or moderately correlated factors as had been found by previous researchers (Crawford & Henry, 2004; Engelen et al., 2006; Terracciano et al., 2003). The results of both the CFA and EFA revealed that the PA and NA factors had a small to moderate, negative relationship. As suggested by previous researchers, these findings indicate that the PA and NA factors are independent dimensions that share a relatively small proportion of variance rather than opposite poles on a unidimensional spectrum (Crawford & Henry, 2004; Tellegen, Watson, & Clark, 1999).

Poor model fit may be caused by shared method variance among indicators that is unaccounted for by the specified model (Byrne,

2005). This method variance can result from indicators that use similar or redundant methodology, or in this case item content. Previous researchers have found that model fit was improved by specifying covariation among item uniquenesses to account for shared method variance (Crawford & Henry, 2004). Thus, another aim of the present study was to examine the improvement in model fit that resulted from a respecified model. After modifying the CFA model to include covariation between theoretically redundant items, the model still failed to provide adequate fit.

The final aim of the present study was to provide evidence for the reliability and validity of its scores in multiple ethnic groups. As with the overall sample, both the PA and NA scales of the PANAS demonstrated good internal consistency among African American, Asian American, and Hispanic adolescents. Evidence of convergent and discriminant validity was also demonstrated by examining the relationships between the PA and NA scales and measures of stress, depression, and hope. In the overall sample as well as the African American and Hispanic samples, individuals who were high on PA were also high on hope and low on stress and depression. In addition, individuals who were high on NA were also low on hope and high on stress and depression. These results indicate that the PA and NA subscales of the PANAS are valid measures of the PA and NA constructs for ethnic minority adolescents and especially African American and Hispanic adolescents. However, it should be noted that the correlations between the original 20-item PANAS scales and the validity measures were similar in direction and magnitude to the correlations between the 16-item PANAS factors and the validity measures.

For Asian American adolescents, PA was not related to any other variable and NA was only positively related to stress and depression. Previous researchers have also reported inconsistencies in reports of affect in Asian cultural groups. For example, Noh, Kasper, and Chen (1998) reported a negative response bias for Korean Americans on a measure of

NA and established the strongest reliability and validity for the measure after rewording all negatively worded items (e.g., items indicating PA). Furthermore, Uchida, Norasakkunkit, and Kitayama (2004) reviewed theoretical and empirical literature to identify differences between Eastern and Western cultural conceptualizations of happiness and PA. They identified that differences in happiness could be largely attributed to theoretical differences in self-conceptualization (i.e., independent and interdependent self-construals; Markus & Kitayama, 1991). In other words, Uchida et al. (2004) state that although Western cultural conceptualizations of happiness are often defined by personal qualities (e.g., achievement and self-esteem), Eastern cultural conceptualizations of happiness are embedded in a more social context (e.g., social harmony). In addition, they note that Eastern cultures tend to embrace the dialectical conceptualization that PA and NA can coexist more readily than Western cultures and that this is often reflected in their responses to such measures. Uchida et al. further warn that many of the commonly used measures of affect are based on independent conceptualizations; thus, their use, correlates, and predictors will likely be divergent when applied to individuals from Eastern cultures (e.g., Asian).

There are a number of methodological/statistical limitations to the current study. First, it was not possible to validate the structure of the PANAS with individual ethnic groups because of sample size constraints. A more thorough test of the factorial validity and cross-ethnic measurement equivalence of this instrument would have included tests of measurement invariance (see Dimitrov, 2010). Related to this, continuous variables representing age and acculturation effects could have been included as predictors of PANAS items in the context of a multiple-indicator multiple-cause model to further evaluate differential item functioning. Third, the original 20-item PANAS was modified, and thus great care should be taken in using the revised 16-item measure until further replication of these results is observed. And

fourth, the PANAS was assessed at a single time point, thus precluding the possibility that the factor structure could be disaggregated into within- and between-person parts, as affect is known to have both trait and state components (see Merz & Roesch, 2011).

In conclusion, the present study provided important information about the reliability and validity of the PANAS in a large multiethnic sample of adolescents. Although the original factor structure proposed by Watson et al. (1988) could not be confirmed, a revised two-factor model that excluded four items was determined to be reliable and valid. In addition, it was found that the PA and NA factors had a small to moderate negative correlation in the current sample, which is consistent with the findings of previous researchers (see Crawford & Henry, 2004). Evidence was also provided for the reliability and validity of the PA and NA scales in the overall sample as well as among African American and Hispanic groups. For Asian Americans, although adequate evidence was provided for the reliability of the PA and NA scales, evidence of convergent validity was found only for the NA scale, whereas no evidence of validity was revealed for the PA scale. It is suggested that future researchers examine the reliabilities, validities, and factor structures of the PA and NA scales across diverse cultural groups and age ranges. It is also suggested that future researchers further examine the use of the PANAS with Eastern cultural groups.

Declaration of Conflicting Interests

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