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Factor structure and criterion validity of original and short versions of the Negative and Positive Affect Scale (NAPAS)

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ABSTRACT

This study investigated factor structure, reliability, and criterion validity of the original 12-item version as well as an abbreviated 10-item version of Mroczek and Kolarz' Negative and Positive Affect Scale (NAPAS). The sample (N = 2718) was drawn from the third wave of the National Study of Midlife in the United States (MIDUS III). Confirmatory Factor Analysis (CFA) and Exploratory Structural Equation Modeling (ESEM) were used to analyze the data. The 12-item version of the scale demonstrated acceptable psychometric properties. Equally good model fit and reliability and identical criterion correlations were also found for the 10-item version of the scale. This suggests that scale shortening did not have any adverse psychometric effects. ESEM produced slightly better fit and considerably lower factor correlations, and thus was considered superior to CFA in the context of this study. Overall, these results indicate that both versions of the NAPAS show evidence of acceptable psychometric quality. Implications of the results and avenues for future research are discussed.

1. Introduction

Negative affect (NA) and positive affect (PA) have been implicated as core components in many mental disorders, as well as in psychological theories of human development, temperament, and personality (Allan, Lonigan, & Phillips, 2015). They also constitute the emotional component of subjective well-being (Lucas & Diener, 2015). NA and PA have been measured using various scales, including the 20-item Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). Despite the pervasive use of the PANAS in psychological research (Diener, Kesebir, & Tov, 2009), the PANAS does not in fact measure general positive and negative affect. Instead, it measures positive and negative activation (Watson, Wiese, Vaidya, & Tellegen, 1999). Low-arousal positive and negative emotions (e.g., relaxed and sluggish) have been excluded from the scale, based on the notion that they only reflect the absence of activation, and thus their measurement is not essential (Watson et al., 1999). This exclusive focus on active emotions may, however, lead us to overlook the central role of low-arousal emotions for many people, religions, and cultures (for a review, see Tsai, 2007). For example, emotions such as peacefulness and relaxation are considered as crucial components of happiness in some non-Western cultures (Joshanloo, 2014). Researchers have also highlighted a number of psychometric issues associated with the use of the PANAS. For example, the factor structure of the scale is still being debated, it's factor structure can require a large number of item residual covariances to reach acceptable fit, and the items can function dramatically differently across various studies and cultural contexts (e.g., Allan et al., 2015; Gaudreau, Sanchez, & Blondin, 2006; Leue & Beauducel, 2011; Merz et al., 2013; Terraciano, McCrae, & Costa, 2003). Given these caveats, there is a growing demand for affect scales yielding clearer factor structures with better chances of cross-cultural replicability.

Mroczek and Kolarz' (1998) Negative and Positive Affect Scale (NAPAS[1]) measures general affect with six items per subscale. The items capture a combination of high-arousal (e.g., "nervous") and low-arousal (e.g., "calm and peaceful") affective states. NA and PA yielded alphas of 0.87 and 0.91, respectively, in a sample of 2727 American adults (Mroczek & Kolarz, 1998). Confirmatory factor analysis (CFA) has shown that with two item residual covariances, the factor structure of the scale achieves acceptable fit indices (Joshanloo & Bakhshi, in press).

Highly correlated residual covariances reflect substantial overlap in the contents of item pairs (Joshanloo, 2016b; Terraciano et al., 2003). One common strategy to deal with highly correlated residuals is to permit a covariance between the item pairs, if the two items are within the same subscale, and if the covariance is theoretically justifiable. Another strategy is to omit one of the items in each item pair, which can result in an abbreviated scale. This can be considered a favorable outcome given the premium currently placed on short scales, particularly for inclusion

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[1] Mroczek and Kolarz use a separate title for each subscale: the Negative Affect Scale and the Positive Affect Scale. In the present study, the title "the Negative and Positive Affect Scale" (NAPAS) is used to refer to the whole scale for convenience, and also to distinguish the scale from other affect scales.

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in long surveys that demand considerable participant time (Heene, Bollmann, & Bühner, 2014). However, shortening may degrade the reliability of the scale (Schweizer, 2011), or cause substantial decrements in model fit and criterion validity (Heene et al., 2014; Rammstedt & Beierlein, 2014). Therefore, it is important to critically examine the impact of shortening on the statistical properties of the scale. When omitting overlapping items proves to be substantially detrimental to psychometric quality of the scale, the strategy of correlated item residuals should be preferred.

1.1. The present study

Using a large and recent American sample, the present study sought to investigate the factor structure and criterion validity of the NAPAS, and to explore the possibility of developing a short version of the scale. The original model of the scale and two modified models were compared in the present study. The modified models included a model with correlated item residuals, and a model excluding items with overlapping content. The models were compared based on their fit, internal consistency, and criterion validity. Four variables were chosen as criterion variables: neuroticism, extraversion, self-esteem, and life satisfaction. Neuroticism has been found to be positively correlated with NA and negatively correlated with PA (Lucas & Diener, 2015). Extraversion, self-esteem, and life satisfaction have been found to be negatively related to NA and positively related to PA (Lucas & Diener, 2015; Schimmack & Diener, 2003). It was expected that these relationships would be replicated in the present study with both the original and short versions of the NAPAS.

1.2. Analytical strategy

Joshanloo and colleagues' (Joshanloo, in press; Joshanloo, Bobowik, & Basabe, 2016) research on various scales of mental well-being indicates that usually the factor structure of well-being scales cannot be adequately represented within a simple structure CFA approach. Recent research in other fields (such as personality psychology) also raises doubt about the adequacy of traditional CFA in capturing the factor structure of many psychological scales (Marsh, Morin, Parker, & Kaur, 2014; Morin, Marsh, & Nagengast, 2013). The main reason for CFA's failure is thought to be its overly restrictive assumption that each item should load on a single latent factor, and its loadings on other factors should be fixed at zero. In practice, items with non-zero correlations with more than one latent factor are far from rare (Asparouhov, Muthén, & Morin, 2015). Yet, a majority of factor loadings are constrained to zero in CFA, which tends to result in inaccurate estimates, including overestimated factor correlations (Marsh et al., 2014).

The new technique of Exploratory Structural Equation Modeling (ESEM) has been suggested as a substitute for CFA (Asparouhov & Muthen, 2009). In ESEM, all items are permitted to load on all factors. When there are significant cross-loadings (which is almost always the case), ESEM tends to produce better fit and less inflated factor correlations. Marsh et al. (2014) recommend that researchers routinely conduct and report the results of both CFA and ESEM. If ESEM reveals significant non-target loadings, and yields better fit and less inflated factor correlations, the results of ESEM should be considered superior to those of CFA. Otherwise, CFA is preferable on the basis of parsimony. Previous research with well-being scales suggests that ESEM nearly always outperforms CFA in capturing the factor structure of well-being scales (e.g., Joshanloo, 2016a; Joshanloo, Jose, & Kielpikowski, in press). Moreover, ESEM analyses have revealed significant cross-loadings in the Persian version of the NAPAS (Joshanloo, 2016b). Therefore, a mere reliance on CFA when studying the factor structure of affective constructs may lead to incomplete and inaccurate conclusions. Accordingly, in the present study, both ESEM and CFA were used and their results were compared.

2. Method

2.1. Participants

The data were drawn from the third wave of the National Study of Midlife in the United States (MIDUS III; Ryff et al., 2016). Data collection took place in 2013–2014. The overall MIDUS III sample consists of 3294 respondents. Females constitute 54.9% of the sample. The mean age is 63.64 ($SD = 11.35$). Of the sample, 88.7% chose "white" as their main racial origin, 3.7% self-identified as "black and/or African American", and the rest of the sample chose other categories. Due to missing data on all of the affect items, 576 participants were excluded, leaving a final sample of 2718 to be used in the present analyses.

2.2. Measures

2.2.1. Affect

On a scale from 1 = *all* to 5 = *none of the time*, respondents indicated how much they felt 12 affective states during the past 30 days (Mroczek & Kolarz, 1998). The items are shown in Table 2.

2.2.2. Neuroticism

Respondents indicated how well four self-descriptive adjectives (i.e., Moody, Worrying, Nervous, Calm) described them, on a scale from 1 = *a lot* to 4 = *not at all* (Lachman & Weaver, 1997) ($\alpha = 0.714$).

2.2.3. Extraversion

Respondents rated how well five adjectives (i.e., Outgoing, Friendly, Lively, Active, Talkative) described them, on a scale from 1 = *a lot* to 4 = *not at all* (Lachman & Weaver, 1997) ($\alpha = 0.756$).

2.2.4. Self-esteem

Respondents indicated their agreement with seven statements (e.g., "I certainly feel useless at times"), on a scale from 1 = *strongly agree* to 7 = *strongly disagree* (Rosenberg, 1965) ($\alpha = 0.757$).

2.2.5. Life satisfaction

Five items were used to measure life satisfaction (Prenda & Lachman, 2001), using a scale from 0 = *the worst possible* to 10 = *the best possible*. The items captured satisfaction with overall life, work, health, relationship with spouse/partner, and relationship with children ($\alpha = 0.632$).

When necessary the items were reverse-coded. More information about the sample, procedure, and variables can be found on the MIDUS official website (http://midus.wisc.edu).

2.3. Statistical analysis

Model fit was assessed in Mplus 7.4, with maximum likelihood and an oblique geomin rotation ($\varepsilon = 0.5$). A minimum cutoff of 0.95 for Comparative Fit Index (CFI), a maximum cutoff of 0.08 for Root Mean Square Error of Approximation (RMSEA), and a maximum cutoff of 0.08 for Standardized Root Mean Square Residual (SRMR) were considered as indicative of acceptable fit (Browne & Cudeck, 1993; Hu & Bentler, 1999; Weston & Gore, 2006). Models with smaller values of AIC (Akaike information criterion) and BIC (Bayesian information criterion) are preferred to those with higher AIC and BIC values. In the one-factor models, all of the items were specified to load on a single affect factor.

3. Results

3.1. Factor structure and factor loadings

The fit indices for the models are presented in Table 1. Because the fit of the one-factor models were very bad, these models are not discussed