Psychometric Properties of a Brief Version of the Penn State Worry Questionnaire in African Americans and European Americans
Ryan C. T. DeLapp, L. Kevin Chapman, and Monnica T. Williams

CITATION
Psychometric Properties of a Brief Version of the Penn State Worry Questionnaire in African Americans and European Americans

Ryan C. T. DeLapp, L. Kevin Chapman, and Monnica T. Williams
University of Louisville

The reliable and valid assessment of chronic worry in African Americans is vital when attempting to draw cross-cultural comparisons between African Americans and other ethnic groups. As such, the current study examined the psychometric properties of a brief version of a gold standard assessment of chronic worry, specifically the Penn State Worry Questionnaire-Abbreviated (PSWQ-A; Hopko et al., 2003) in a college sample of African Americans (n = 100) and European Americans (n = 121). Results indicated that the PSWQ-A total score has good internal consistency and convergent validity with another measure of anxiety, but less than favorable discriminant validity with a measure of depression in African American and European American students. Also, the 1-factor solution for the 8-item PSWQ-A had excellent model fit in our full sample and was partially invariant between ethnic groups. Collectively, the present study provides evidence that the PSWQ-A is a psychometrically sound option for assessing chronic worry and suggests that this brief measure may enhance the time efficiency and clinical utility of research and clinical assessments in ethnically diverse samples.

Keywords: worry, African Americans, measurement invariance, cross-cultural assessment

Worry can be defined as poorly controlled future-directed cognitions that anticipate the occurrence of negative events. Commonly, the perseverative and often unproductive thought processes associated with worry are an attempt to engage in mental problem solving and may appear to be a viable coping strategy during stressful events for some individuals (Hong, 2007). However, the cognitive avoidance theory of worry proposes that excessive worrying (or chronic worry) represents an internal avoidance response that ultimately leads to the maintenance of aversive negative affective states (e.g., anxiety and sadness; Borkovec & Roemer, 1995; Fresco, Heimberg, Mennin, & Turk, 2002). In particular, chronic worry has been theorized to contribute to the avoidance of negative emotional experiences (e.g., aversive imagery, and intense arousal; Fresco et al., 2002; Hong, 2007). Notably, nascent findings suggest that engaging in worry does not necessarily result in the avoidance of negative affect (see review by Newman & Llera, 2011). Rather, chronic worry may be more accurately characterized as a coping strategy to avoid a negative contrast (i.e., going from a positive to negative emotional state in response to a feared outcome) as an attempt to fend off a sudden shift in emotion by remaining chronically distressed (Newman & Llera, 2011). Moreover, though the excessiveness of worry is considered the core feature of generalized anxiety disorder (GAD; American Psychiatric Association, 2013), extant literature has demonstrated that this cognitive process influences the manifestation of a myriad of psychological symptoms, including anxiety, depression, paranoia, and aberrant eating patterns (Muris, Roelofs, Rassin, Franklin, & Mayer, 2005; Sassaroli et al., 2005; Freeman et al., 2012).

Given the mental health implications of chronic worry, it is necessary that assessment tools examining this psychological symptom are reliable and valid across diverse cultural groups. Notably, nascent literature has provided evidence suggesting that gold standard assessments for worry have poor psychometric qualities in African American samples (Scott, Eng, & Heimberg, 2002; Hambrick et al., 2010). Cultural variables that have been theorized to influence the variability of worry in African Americans include acculturation status (the balancing of national vs. ethnic cultural streams of influence; Carter, Sbrocco, & Carter, 1996), ethnic identity (one’s sense of belonging to their ethnic group; Carter et al., 1996), and race-based stressors (e.g., racism and discrimination; Rucker, West, & Roemer, 2010). Also, according to a review by Hunter and Schmidt (2010), African Americans are believed to have unique patterns of symptom expression, which include the heightened awareness of somatic sensations and a lower tendency to endorse cognitive-affective symptoms of anxiety. In support of this theory, Hunter and Schmidt explain that the stigma toward mental illness (or “negative feelings, attitudes, beliefs, and behaviors about mental illness because of negative implications for individuals with mental illness”) within the African American community contributes to the underendorsement of cognitive-affective symptoms of anxiety disorders (p. 213). Conversely, these authors purport that the increased prevalence of certain physical illnesses (e.g., hypertension, cardiovascular diseases, and diabetes) within this population generates a heightened awareness of the somatic components of anxiety disorders. Although extant literature has yet to examine how these aforementioned variables...
influence the prevalence of GAD among African Americans, ev-

evidence has shown that the incidence of GAD differs between

African Americans and European Americans. Despite evidence
demonstrating that African Americans have a lower 12-month and

lifetime prevalence of GAD relative to European Americans

(Grant et al., 2005; Himle et al., 2009), more recent findings
suggest that African Americans tend to experience more severe

and longer-lasting symptoms of worry (Sibrava et al., 2013) and
greater impairment (Himle et al., 2009), which highlights the
distress caused by chronic worry in this population. Collectively,
extant literature provides evidence that the aforementioned cultural
variables contribute to the manifestation of chronic worry in Af-

rican Americans and warrants an examination of whether an as-

essment tool yields a valid measurement of worry in this popu-

lation.

As such, the current study examines the psychometric properties
of the Penn State Worry Questionnaire-Abbreviated (PSWQ-A;

Hopko et al., 2003) in African American and European American
college students. In particular, the authors call to question whether
this brief version of a gold standard assessment of chronic worry
can accurately capture variability in symptom expression among
African American college students.

Factor Structure of the PSWQ

Considering the potential impact of cultural variables on worry
in African Americans, it is paramount that the psychometric prop-
erties of widely used measures of worry are validated in diverse
ethnic groups. One of the most commonly used assessments of
worry is the Penn State Worry Questionnaire (PSWQ; Meyer,
Miller, Metzger, & Borkovec, 1990), which is a 16-item measure
that assesses persistence and severity of worry on a 5-point Likert
scale (1 = not at all typical of me to 5 = very typical of me).

Existing literature has indicated that the PSWQ total score is
internally consistent, has good temporal stability, and acceptable
convergent and discriminant validity in predominantly European
American nonclinical (Meyer et al., 1990) and clinical samples
(Brown, Antony, & Barlow, 1992). Despite its sound reliability
and validity, a recent survey of literature reveals mixed findings
regarding the factor structure of the PSWQ. Originally, the PSWQ
was considered a unidimensional assessment of worry comprised
of 11 positively worded items and five negatively worded items
(Meyer et al., 1990; Brown et al., 1992); however, a separate body
of findings indicate that a two-factor solution better captures the
pattern of responding on this assessment tool (Beck, Stanley, &
Zebb, 1995; Fresco et al., 2002; Olutunji, Schottenbauer, Rodríguez,
Glass, & Arnkoff, 2007). In particular, the two-factor solution
has consistently contained a factor comprised of the 11 posi-

tively worded items characterizing the presence of worry and a
factor that includes five negatively worded items describing the
absence or dismissal of worry.

Despite evidence supporting the two-factor solution as superior
to the one-factor solution, recent literature has begun to question
whether these two factors are reflective of true dimensional dif-

ferences in the manifestation of worry or whether these factors are
simply the result of statistically driven method effects (Brown,
2003; Hazlett-Stevens, Ullman, & Craske, 2004; Hambrick et al.,
2010). Given that the PSWQ was originally designed to be a
unidimensional assessment of chronic worry, Hazlett-Stevens and

colleagues designed a series of studies to demonstrate that the
superior fit of the two-factor solution could potentially be ex-

plained by differences in item wording. Initially, researchers found
that the two-factor solution had adequate model fit whereas the
one-factor solution had poor fit, which replicated findings in

previous literature. However, to examine their hypothesis that the
model fit of the one-factor solution would become comparable to
the two-factor solution when accounting for differences in item
responding (i.e., the proposed method effect), the authors created
a model with all 16 PSWQ items loading onto one factor and
added a separate, uncorrelated factor containing only the five
negatively worded items of the PSWQ (considered the method
factor). With the addition of the method factor, this new model was
able to capture the shared variance between these five items that
was theoretically due to similarities in their measurement. As such,
Hazlett-Stevens and colleagues (2004) demonstrated that when
accounting for the method effect of item wording, the one-factor
solution also had adequate model fit across separate ethnically
diverse samples of college students. Additionally, Hazlett-Stevens
et al. found that a factor containing all 16 PSWQ items and a factor
containing the positively worded items significantly predicted
GAD diagnostic status in separate analyses. Contrarily, the method
factor containing the negatively worded items did not exhibit a
significant relationship with diagnostic status. Altogether, their
findings imply that the separate pattern of responding captured by
the negatively worded items (i.e., the Absence of Worry factor) is
a byproduct of the method of measurement (i.e., the wording)
rather than a separate underlying construct of chronic worry with
meaningful relationships with other psychological outcomes.

Moreover, though Olutunji and colleagues (2007) did not specif-
cally test the impact of method effects on the factor structure of
the PSWQ, their findings suggest also that the factor containing the
five negatively worded items lacks practical utility regarding its
relation to other psychological variables. Specifically, researchers
found that the 11 positively worded items had stronger relation-
ships with other psychological variables (e.g., trait anxiety, nega-
tive affect) relative to the factor describing the absence of worry
and proposed that these findings indicate that the 11 positively
worded items of the PSWQ appear to be particularly useful in
understanding the relationship between worry and other psycho-

logical constructs. Collectively, these findings suggest that the
two-factor solution is potentially an artifact of method effects, and
therefore lacks practical application to the study of how worry
relates to other variables.

PSWQ-A: A Resolution of Method Effects

In line with the aforementioned findings, research has begun to
progress beyond the impact of method effects on the factor struc-
ture of the PSWQ by identifying an abbreviated version of the
assessment tool that only contains eight of the 11 positively worded
items, therefore removing the impact of differential responding
due to the wording of the item. Originally, Hopko and colleagues
(2003) examined the utility of the full-length PSWQ in a predo-
nomantly European American sample of older adults and found that
neither the one- nor two-factor solutions were representative of
worry in their sample. Subsequently, researchers modified the
one-factor solution according to procedures detailed by Hatcher
(1994) because it had better internal consistency relative to the
two-factor solution in their older sample. In particular, Hopko and colleagues (2003) described that they first determined if the factor loadings were significant for all 16 items of the one-factor solution and second examined LeGrange multiplier values, which help determine if the model will be improved by removing a specific item. The criteria used for the LeGrange analysis consists of identifying any item with normalized residual values above 2, meaning that item has problematic (extremely high) measurement error. As such, researchers eliminated the five negatively worded items due to violations of both modification criteria, which suggested that these items were negatively impacting the fit of the one-factor solution. Moreover, despite all 11 of the positively worded PSWQ items having significant factor loadings, three of the 11 items (i.e., Items 14, 15, and 16) had high normalized residual values, which led researchers to eliminate these items. The final product of their model modification analyses yielded a shortened, unidimensional scale containing the eight items. Researchers entitled this revised assessment of worry the PSWQ-A (Hopko et al., 2003), which yielded excellent psychometric properties in their elderly sample as evidenced by high correlations with the full-length PSWQ total score ($r = .92$), good internal consistency ($\alpha = .87$), acceptable convergent validity with other anxiety measures ($r = .33–.49$), as well as discriminant validity with depression measures ($r = .11–.16$). Moreover, Crittendon and Hopko (2006) examined the psychometric properties of the PSWQ-A total score in a predominantly European American sample of college students and found that it demonstrated strong construct validity with the full-length PSWQ ($r = .83$), excellent internal consistency ($\alpha = .94$), strong test–retest reliability ($r = .87$), and adequate convergent validity with anxiety measures ($r = .67–.74$). However, results suggested that the PSWQ-A total score may poorly distinguish anxious-related worry from depressive symptoms as the discriminant validity between the PSWQ-A and the BDI among the younger sample was less than favorable ($r = .57, p < .01$). Finally, the PSWQ-A total score has been shown to have good internal consistency (McDonald’s $\omega = .95$) and convergent validity with measures of anxiety ($r = .39–.68$) within a clinical population (majority diagnosed with major depressive disorder and GAD; Kertz, Lee, & Bjorgvinsson, 2014). Also, Kertz and colleagues (2014) found that the PSWQ-A captured significant differences in the endorsement of worry between individuals with and without GAD. Together, these findings suggest that the PSWQ-A may represent a shortened assessment tool that validly expedites the evaluation of chronic worry and therefore permits an attempt to replicate these findings in the current study.

PSWQ in African Americans

Of the few studies that have compared the use of the PSWQ within African American samples, evidence suggests that there are psychometric disparities in the soundness of the full-length measure in this population. For instance, though African Americans have demonstrated comparable average scores on the PSWQ relative to European Americans and Asian Americans (Scott et al., 2002), Hambrick and colleagues (2010) found that there were differential response patterns on several of the PSWQ items as evidenced by incongruent item characteristic curves for each item, indicating that the PSWQ may yield biased assessments of worry in African Americans and suggesting that certain items are less associated with worry symptoms in African American relative to European American college students. Additionally, Carter et al. (2005) compared the factor structure of the PSWQ across African American and European American college students and found that the one- and two-factor solutions were a poor fit to their overall sample comprised of both European American and African American students. As a result, Carter and colleagues (2005) conducted a multigroup confirmatory factor analysis and compared the fit of the two-factor solution in each ethnic subsample to better explain the poor fit of this model in their combined sample. Despite finding that the factor structure comprised of negatively worded items was statistically different between the ethnic subsamples, researchers found that the factor containing the 11 positively worded items exhibited measurement equivalence across both samples. Moreover, Carter and colleagues (2005) found that the factor containing the 11 positively worded items was significantly correlated with measures of anxiety and depression for both European American and African American college students. Collectively, the statistical invariance across the factor containing positively worded items and its significant correlations with measures of depression and anxiety corroborates the assertion proposed by Olatunji et al. (2007) that these items are useful and, importantly, implies that a shortened version of the PSWQ can be used to make valid comparisons between African Americans and European Americans. Altogether, these findings suggest that the factor structure of the full-length PSWQ is nonequivalent between African American and European American college students, therefore suggesting there is the potential for a nonbiased comparison if an abbreviated version of the measure were utilized.

Given the dearth in literature replicating extant findings regarding the utility of the PSWQ in African American samples, the primary goal of the current study is to provide evidence supporting or refuting the measurement invariance of assessing worry between European American and African American college students. We seek to examine whether latent mean differences in worry between these ethnic groups are valid estimates that are not significantly biased by unequal response patterns. Specifically, the term “biased” here refers to discrepancies in the fit of the estimated latent variable model to the observed data in each ethnic group, which could result from unequal factor structures, the method of measurement, or different item response patterns between these groups (Sass, 2011). According to a review article by Steenkamp and Baumgartner (1998), latent mean comparisons are more reliable and meaningful when the majority of parameters within the measurement model are constrained to be equal across groups, thereby yielding a more unbiased comparison. As such, it is our goal to use multigroup confirmatory factor analysis to determine if a measure of worry yields a relatively unbiased mean comparison within our ethnically diverse sample. Furthermore, unlike the aforementioned studies that have examined cross-cultural comparisons on the PSWQ (Scott et al., 2002; Carter et al., 2005; Hambrick et al., 2010), the current investigation will utilize the PSWQ-A total score to examine the psychometric properties of this shortened assessment tool in African American college students as well as its measurement invariance relative to European Americans. In particular, we believe that using the PSWQ-A affords several advantages that will advance our understanding of the cross-cultural assessment of worry. First, given that the PSWQ-A only includes positively worded items, the previously
demonstrated method effect due to negatively worded items is removed (Hazlett-Stevens et al., 2004) and provides a more parsimonious model for assessing worry. Additionally, the current study’s use of the PSWQ-A represents an effort to provide further evidence supporting the psychometric soundness of a shortened assessment tool as well as to begin establishing normative data to inform the use of these eight items to assess worry in African Americans.

Method

Participants

The current study includes 221 undergraduate students from a Midwestern university who participated in a larger study examining factors that influence of psychological symptoms in college students. The overall sample was predominantly female (67.9%) and consisted of 121 young adults who self-identified as European American and 100 who self-identified as African Americans. The African American sample ($M = 21.70, SD = 5.81$) was on average older and had more variability in age relative to the European American sample ($M = 19.14, SD = 3.52$); however the female-male ratio was relatively equal across groups (e.g., approximately 2:1).

Measures

The PSWQ-A (Hopko et al., 2003) is an eight-item assessment of the excessiveness and uncontrollability of worry. The PSWQ-A has demonstrated excellent internal consistency ($\alpha = .87$–.94) and moderate to strong test–retest reliability ($r = .63$–.87) in predominantly European American samples of younger and older adults (Hopko et al., 2003; Crittendon & Hopko, 2006). Extant literature has also shown that the PSWQ-A total score is correlated with the full-length PSWQ total score, indicating that the abbreviated assessment maintains its construct validity, and is moderately correlated with various measures of anxiety (e.g., State-Trait Anxiety Inventory [STAT-Trait Version] and Beck Anxiety Inventory [BAI] total scores), demonstrating its convergent validity in predominantly European American samples of young and older adults (Hopko et al., 2003; Crittendon & Hopko, 2006). The participant responses utilized to examine the PSWQ-A in the current study were derived from a single administration of the PSWQ full version.

The PSWQ (Meyer, Miller, Metzger, & Borkovec, 1990) is a 16-item questionnaire that examines worry using positively and negatively worded items. The PSWQ total score has demonstrated good internal consistency ($\alpha = .86$ to .93) in community and college-based samples and acceptable test–retest reliability in ethnically diverse college based samples (Brown et al., 1992; Fresco et al., 2002). Specifically, it has been shown to have adequate internal consistency ($\alpha = .84$) in a predominantly African American college sample (Scott et al., 2002).

The BAI (Beck & Steer, 1990) is a 21-item self-report measure designed to assess clinically significant anxiety on a 4-point Likert scale. The BAI total score has demonstrated good psychometric properties as evidenced by high internal consistency ($\alpha = .92$) and good test–retest reliability ($r = .83$; Beck, Epstein, Brown, & Steer, 1988). Also, the BAI total score has exhibited good convergent validity with other anxiety self-report measures and discriminant validity with assessments of depression (Beck et al., 1988). In the current study, the internal consistency of the BAI was .88 for the African American sample and .84 for the European American sample. The BAI total score was used as a criterion variable to examine the convergent validity of the PSWQ-A.

The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item self-report designed to assess depressive symptomology within the past week on scale of 0 to 3. The BDI-II total score has demonstrated good reliability and high correlations with other measures of depression (Beck, Steer, & Garbin, 1988). It has been shown to have good psychometric properties in African Americans (Dutton et al., 2004; Sashidharan, Pawlow, & Pettibone, 2012). In the current study, the internal consistency of the BDI was .86 for the African American sample and .89 for the European American sample. The BDI-II total score was used in the current study as a criterion variable to examine the discriminant validity of the PSWQ-A.

Statistical Approach

Structural equation modeling. An analysis of moment structure program (AMOS; Arbuckle, 2012) was utilized to examine the model fit of a single latent variable comprised of eight positively worded items from the full-length PSWQ (Meyer et al., 1990) in our full sample. Several items comprising the PSWQ-A violated the assumption of normality as evidenced by standardized skewness and kurtosis values above 1.96 (Field, 2009). However, due to the robustness of the maximum likelihood estimation against violations of multivariate normality within samples exceeding 100 participants (see review by Iacobucci, 2010), the current study utilized the maximum likelihood estimation to examine model fit in subsequent analyses. Fit indices outlined by Hu and Bentler (1999) were used to evaluate the appropriateness of the model. Good model fit was determined by a nonsignificant chi goodness-of-fit test, a comparative fit index (CFI) greater than .95, and a root-mean-square error of approximation (RMSEA) less than .08.

After establishing a good fitting model for the full sample, the current study followed the steps outlined by Byrne (2004) and Kline (2011) to conduct a multigroup confirmatory factor analysis (MCFA), which systemically compares the unsaturated solutions of measurement models with differing constrained parameters (e.g., factor loadings, error variance) to identify any non-equivalence between groups. According to recommendations by Little, Slegers, and Card (2006), the authors fixed the factor variances to be equal across both ethnic groups, which allowed the invariance of each factor loading and item intercept to be examined in the MCFA. The authors first examined the configural invariance of the model by allowing all model parameters (i.e., factor loadings, factor variance, and measurement error) to be unconstrained (or vary freely) within each ethnic group. Next, the construct-level metric invariance was tested by constraining factor loadings to be equal between groups and examining the model fit between the unconstrained and equal factor loading models (Kline, 2011). In the remaining steps of the MCFA, the authors implemented even stricter constraints on the measurement model in each group to determine if the intercept of each item and each item’s measurement error are invariant. At each step of the analysis, several model indicators were utilized to examine parameter in-
variance. In addition to the chi-square difference test, which is heavily influenced by sample size, model complexity, and the proportion of nonequivalence between groups (Chen, 2007), we utilized changes in CFI, RMSEA, and Akaike information criterion (AIC) values to evaluate measurement invariance. Specifically, a change of less than .005 in CFI (∆CFI) values and a change in the RMSEA value falling within the 90% confidence interval of the less restricted model provides evidence of parameter invariance between groups (Chen, 2007). Additionally, AIC values that decrease in value between steps of the analyses were used to provide further evidence of invariance (Skinner & Chu, 2014).

Finally, after we determined a final model that was comparable between groups (i.e., a model that has the appropriate parameters constrained and/or unconstrained), the authors compared the latent means between the groups. To execute this step of the analysis, the factor mean comprised of the eight items of the PSWQ-A in the African American group was allowed to freely vary, whereas European American students were made the reference group by setting their factor mean to zero (Widaman & Reise, 1997; Niehaus & Adelson, 2013).

**Descriptive statistics and group comparisons.** To examine the psychometric validity of the PSWQ-A in the current sample, the current study utilized SPSS software (Version 22) to calculate the Pearson correlation coefficient to measure the linear relationships between the PSWQ-A and measures of anxiety and depression. To determine if these linear relationships are statistically invariant between African American and European American student samples, we tested the model fit when constraining the correlations to be equal between the ethnic subgroups and utilized the aforementioned criteria (i.e., ∆CFI < .005, decreased AIC value, the nonsignificant chi-square difference test) to establish measurement equivalence.

### Results

**Descriptive Data and Reliability**

Descriptive data indicated that the PSWQ-A total score ($M = 22.23$, $SD = 8.68$) was highly correlated with the full length PSWQ total score ($r = .97$, $p < .001$) in the overall full sample. For European American students, the PSWQ-A total score ($M = 23.9$, $SD = 8.48$) exhibited a high correlation with the full length PSWQ total score ($r = .97$, $p < .001$). Similarly, the African American sample ($M = 20.2$, $SD = 8.52$) demonstrated a high correlation between the total scores of the abbreviated and full length assessments ($r = .96$, $p < .001$). These results replicate previous literature (e.g., Crittendon & Hopko, 2006) in demonstrating that the total scores of the abbreviated and standard versions of the PSWQ are correlated in our full sample and within each ethnic subsample. Additionally, the reliability of the full-length PSWQ and PSWQ-A total scores was compared. For the full sample, the internal consistency of the PSWQ was .72, whereas for the PSWQ-A, it improved to .92. Within each respective ethnic subsample, similar improvements in reliability were observed when using the eight positively worded items comprising the PSWQ-A.

For European American students, the internal consistency improved from .70 on the PSWQ to .92 on the PSWQ-A. Similarly, for African American students, the internal consistency improved from .73 on the PSWQ to .91 on the PSWQ-A.

**Confirmatory Factor Analysis**

To replicate the unidimensional nature of the PSWQ-A demonstrated in extant literature (Hopko et al., 2003; Crittendon & Hopko, 2006), we conducted a confirmatory factor analysis using our full sample. The CFA established that the one-factor model of the PSWQ-A was an excellent fit, $\chi^2(20) = 20.732$, $p = .413$; $CFI = .99$, RMSEA = .013, 90% confidence interval (CI) [.00, .06], for our college sample.

**Multiple-Group Confirmatory Factor Analysis**

Given its excellent model fit indices observed in our full sample, the unidimensional PSWQ-A was used as the base model for our measurement equivalence analyses (Byrne, 2004; Kline, 2011). Due to the good model fit exhibited by the configural invariance model within each ethnic subsample (as shown in Table 1), we proceeded to test the invariance of factor loadings by constraining each loading to be equal between groups. The model constraining factor loadings to be equal demonstrated excellent model fit (RMSEA = .00, CFI = 1.00) and model indicators (e.g., $\Delta$CFI < .005, decreased AIC value, the nonsignificant chi-square difference test) support that it is the preferred model relative to the configural invariance model. Table 2 includes the invariant standardized factor loadings for our sample. The next step was to constrain the intercepts of the indicators in both groups, which yielded a $\Delta$CFI value greater than .005, an increase in AIC, and a significant $\Delta\chi^2$ difference test (as shown in Table 1). After inspecting the item intercepts within each group (as shown in Table 2), it was suspected that Items 4, 5, 6, and 12 were nonequivalent, as they had the largest discrepancies between the groups.

### Table 1

**Steps of the Multiple Groups Confirmatory Factor Analysis Comparing European American and African American College Students**

<table>
<thead>
<tr>
<th>Model</th>
<th>RMSEA (90% CI)</th>
<th>CFI</th>
<th>AIC</th>
<th>$\chi^2(df)$</th>
<th>$\Delta\chi^2(p$ value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Configural invariance</td>
<td>.00 (.00, .04)</td>
<td>1.0</td>
<td>133.94</td>
<td>37.94 (40)</td>
<td>6.71 (.568)</td>
</tr>
<tr>
<td>2. Equal factor loadings</td>
<td>.00 (.00, .04)</td>
<td>1.0</td>
<td>126.65</td>
<td>44.65 (48)</td>
<td>6.71 (.568)</td>
</tr>
<tr>
<td>3a. Equal intercepts</td>
<td>.027 (.00, .05)</td>
<td>.991</td>
<td>129.26</td>
<td>65.26 (56)</td>
<td>20.61 (.008)</td>
</tr>
<tr>
<td>3b. Partially constrained intercepts</td>
<td>.00 (.00, .043)</td>
<td>1.0</td>
<td>120.61</td>
<td>51.61 (52)</td>
<td>6.959 (.138)</td>
</tr>
<tr>
<td>4. Equal residual variances</td>
<td>.019 (.00, .046)</td>
<td>.99</td>
<td>120.61</td>
<td>64.62 (60)</td>
<td>13.01 (.112)</td>
</tr>
</tbody>
</table>

*Note. RMSEA = root-mean-square error of approximation; CI = confidence interval; CFI = comparative fit index; AIC = Akaike information criterion; $\Delta\chi^2 = $ chi-square difference test; $df = $ degrees of freedom. **Boldface** indicates poor model fit as evidenced by $\Delta$CFI values greater than .005, increased AIC values, and a nonsignificant $\Delta\chi^2$ value.*
In reanalyzing the invariance of intercepts with Items 4, 5, 6, and 12 left unconstrained while all other items were set equal, the ΔCFI value became .001, the AIC value decreased, and there was a nonsignificant chi-square difference test (p = .138) suggesting that partial measurement equivalence had been established between the groups. Table 3 displays the intercept values for the constrained items and shows that the four unconstrained items had higher item intercepts in the European American sample. The next step was to set the residual variances (or measurement errors) equal between groups and compare this more restricted model to the model with partially constrained intercepts. Results mostly provided support for equal factor variances as evidenced by a decreased AIC value and a nonsignificant chi-square difference test (p = .112); however, the ΔCFI value equal to .005.

Finally, after identifying a model that exhibited the most measurement invariance between groups, the next step of the analysis utilized latent means to compare self-reported worry across our ethnic subsamples. Results indicated that African American students (M = 20.2, SD = 8.52) endorsed significantly lower worry on the final measurement model relative to European American students (M = 23.9, SD = 8.48; unstandardized estimate = -.414, p = .023).

Convergent and Discriminant Validity

For the full sample, there were moderate correlations (r = .51 to .69) between the PSWQ-A total scores and another assessment of anxiety (i.e., BAI). For European American college students, PSWQ-A total score was significantly correlated with BAI (r = .47, p < .001) total score. For African American students, the PSWQ-A total score was significantly correlated with BAI (r = .52, p < .001) total score. In order to compare the invariance of these correlations across groups, the current study examined the covariance between the BAI total score (an observed variable) and the latent construct of the baseline model (i.e., Model 1 in Table 1). Results indicated that the correlation between the single-factor of the PSWQ-A and the observed BAI total score (ΔCFI = .002; ΔAIC = 5.50, Δχ² = .50, p = .92; estimate = 4.92, p < .001) yielded an acceptable fit. This finding suggests that the correlations between the PSWQ-A and a measure of anxiety are statistically invariant between European American and African American students. Regarding its discriminant validity, the PSWQ-A total score demonstrated a moderate correlation (r = .69) with the BDI-II within the full sample. In particular, the PSWQ-A total score was significantly correlated with the BDI-II total score in the European American (r = .54, p < .001) and African American (r = .54, p < .001) subsamples. In utilizing statistical procedure described above, results indicated that the moderate correlations between the single-factor of the PSWQ-A and the observed BDI-II total score within each ethnic subsample were statistically invariant as evidenced by acceptable model fit when constraining this parameter to be equal (ΔCFI = .001, ΔAIC = 3.65, Δχ² = 2.35, p = .50, ns; estimate = 5.27, p < .001).

Discussion

The primary objectives of the current study were to replicate the sound psychometric properties of the PSWQ-A total score in a sample of young adults as well as compare the factor structures of this unidimensional assessment of worry between African American and European American college students. Our findings demonstrate that this shortened assessment of chronic worry is reliable and valid in young adult samples as shown by Crittendon and Hopko (2006). Specifically, it is concluded that PSWQ-A total score has strong psychometric properties as evidenced by high correlations with the full-length PSWQ, excellent internal consistency, and acceptable convergent validity with anxiety measure. However, the less than favorable discriminant validity between the PSWQ-A total score and BDI-II total score suggests that this abbreviated assessment tool may not differentiate chronic worry from symptoms of depression in college samples, which is consistent with findings from Crittendon and Hopko (2006) as well as previous literature that has found moderate correlations between the BDI-II total score and the full-length PSWQ total score (Beck et al., 1995; Fresco et al., 2002). A contributing factor that may explain the moderate correlation between these measures is that elevations in negative affect (or negative emotional states) are common across individuals who endorse symptoms of chronic worry and depression, which subsequently impacts the pattern of responding on self-report measures like the PSWQ-A and the BDI (Brown, Chorpita, & Barlow, 1998). Overall, when attempting to distinguish the expression of these symptoms, the present study’s

Table 3

<table>
<thead>
<tr>
<th>PSWQ-A items</th>
<th>European American</th>
<th>African American</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 2</td>
<td>2.588</td>
<td>2.588</td>
</tr>
<tr>
<td>Item 4</td>
<td>2.670</td>
<td>2.390</td>
</tr>
<tr>
<td>Item 5</td>
<td>3.063</td>
<td>2.893</td>
</tr>
<tr>
<td>Item 6</td>
<td>3.238</td>
<td>2.911</td>
</tr>
<tr>
<td>Item 7</td>
<td>2.520</td>
<td>2.520</td>
</tr>
<tr>
<td>Item 9</td>
<td>2.796</td>
<td>2.796</td>
</tr>
<tr>
<td>Item 12</td>
<td>2.741</td>
<td>2.364</td>
</tr>
<tr>
<td>Item 13</td>
<td>3.136</td>
<td>3.136</td>
</tr>
</tbody>
</table>

Note. Items 4, 5, 6, and 12 were unconstrained in the current study. These items assess worry caused by multiple situations (Item 4), an inability to stop worrying despite knowing one should not worry (Item 5), the tendency to worry when under pressure (Item 6), and the presence of worry for most of one’s life (Item 12; Meyer, Miller, Metzger, & Borkovec, 1990).
findings suggest that using additional measures of depression and chronic worry may yield more accurate conclusions.

Moreover, the partial measurement equivalence of the PSWQ-A in the current study provides evidence that a shortened version of the full-length PSWQ can be utilized to make unbiased mean comparisons in worry between these ethnic groups. In particular, the factor loadings, factor variance, and residual errors were invariant between European Americans and African Americans. Our findings are analogous to the results of the Carter et al. (2005) in that all 11 positively worded items on the full-length PSWQ (instead of only the eight items examined in our study) demonstrated measurement equivalence between African American and European American college students in their sample. However, the current study uniquely included an analysis of the item intercepts to determine if African American and European American college students have the same scores on each item when the mean of the unidimensional PSWQ-A factor is set to zero (Chen, 2007). Our findings demonstrated that the intercepts of several items must be allowed to vary freely when comparing symptoms of worry as these parameters were unequal between ethnic groups in the current sample.

A prior study utilizing the current sample found that perceived control (as defined by a measure of perceived control of anxiety) explained more variance in symptoms of worry for European Americans whereas psychological distress (as defined by measures of depression and trait-based anxiety) was more indicative of chronic worry for African American young adults (Chapman, Kertz, & Woodruff-Borden, 2009). Based upon these findings, a potential explanation for the intercept nonequivalence for four items on the PSWQ-A may be a result of the heightened relevance of perceived uncontrollability in the European American sample. Notably, compared to the African American sample, European American young adults had higher intercept estimates for several items on the PSWQ-A (i.e., Items 4, 5, 6, and 12, as shown in Table 3) that particularly reflect various aspects of one’s perceived uncontrollability of worry, such as the chronic nature and pervasiveness of uncontrollable worry. Altogether, though more empirical evidence is needed to support the heightened salience of perceived control to the symptoms of worry in European Americans relative to African Americans, our findings suggest that our European American college sample may perceive these four items differently than the African American sample, therefore creating a biased mean comparison if these items are not allowed to vary freely between ethnic groups.

Despite the nonequivalence of these item intercepts, it is proposed that by allowing these item intercepts to vary freely within the unidimensional factor structure, we have improved the reliability of the latent mean comparison of the PSWQ-A between our ethnic samples. And, the removal of biased intercept estimates supports the use of this assessment tool to compare symptoms of worry between European American and African American college students. According to Steenkamp and Baumgartner (1998), a measurement model that has the majority of its parameters constrained, as demonstrated in the current study’s final model, yields a more reliable mean estimate between groups. Notably, in using the partially constrained factor structure of the PSWQ-A, the unstandardized effects within the current study provided evidence indicating that African Americans, on average, endorse less worry relative to European Americans (Grant et al., 2005). In contrast to this finding, Scott and colleagues (2002) found that the average scores on the full-length PSWQ are comparable across African American, European American, and Asian American college students. However, the current study’s finding is believed to reflect a more accurate comparison given that a brief version of the PSWQ that eliminates the impact of method effects was used and non-equivalent items creating biased mean comparisons were accounted for. Moreover, the endorsement of less worry among African Americans relative to European Americans appears to be consistent with epidemiological data indicating lower prevalence rates of chronic worry (as defined by a diagnosis of GAD) in African Americans (Grant et al., 2005; Himle, Baser, Taylor, Campbell, & Jackson, 2009; Soto, Dawson-Andoh, & BeLue, 2011). Additionally, it has been proposed that the lower endorsement of chronic worry among African Americans may be attributable to the cultural variables that influence their patterns of symptom expression. In particular, Hunter and Schmidt (2010) have theorized that the stigma toward mental illness and a greater incidence of certain physical illnesses within the African American community result in the lower endorsement of cognitive/emotional symptoms and a greater reporting of somatic sensations of anxiety.

Given that worry is theorized to function as a cognitive problem solving strategy to avoid negative emotional experiences (Hong, 2007; Newman & Llera, 2011), the lower endorsement of worry (i.e., a cognitive-affective process) relative to European Americans may be influenced by this pattern of symptom expression among African Americans. Although this model has yet to be studied within the context of worry, it suggests that the content of the PSWQ-A may not be conducive to the patterns of symptom expression in this population, as the eight items of this brief measure do not focus on the excessiveness of worry within the context of somatic sensations (e.g., restlessness, disrupted sleep).

Limitations

There are several methodological limitations that should be considered. First, the current study utilized more stringent model fit criteria recommended by Chen (2007) to account for a less than favorable sample size. However, despite our attempt to account for the small sample with these criteria, there is concern that the sample estimates of the latent mean for the PSWQ-A may vary from sample to sample as a byproduct of our small sample size. Although the current study represents the first attempt to explore the measurement equivalence of the PSWQ-A between African Americans and European Americans, it is strongly recommended that our findings are replicated using a larger sample prior to drawing firm conclusions from the current study. Specifically, it is important to determine whether the partial measurement invariance implicated in this study is specific to the current sample or generalizable to other samples containing these ethnic groups.

Additionally, due to concerns about sample size, there are limitations in our findings regarding the invariance of correlations between the PSWQ-A and measures of anxiety and depression. To minimize the number of parameters estimated in each model, the current study uses the observed total scores from the BAI and BDI rather than estimating a latent construct for anxiety or depression. Without conducting a confirmatory factor analysis for these measures, our findings do not verify that the single-factor structures for the BAI and BDI have adequate model fit within our full sample.
As such, future research that utilizes a larger sample should attempt to replicate the invariant covariances found in the current study by correlating the latent construct of the PSWQ-A with the latent constructs of the BAI and BDI and test whether these covariance parameters are equivalent between ethnic groups. Altogether, the aforementioned concerns regarding the current study’s sample size warrants that future research verify (a) whether the unidimensional model of the PSWQ-A is partially invariant within a larger sample of African American and European Americans and (b) whether the construct validity of the PSWQ-A in consistent across these groups.

Aside from the methodological limitation of a small sample size, our findings were also derived from a single administration of the PSWQ full version, where responses for the eight items comprising the PSWQ-A were obtained from the same administration of the PSWQ full version. An issue with our study’s procedure is that it does not allow for the psychometric properties of the PSWQ-A to be examined within its intended measurement context (i.e., a stand-alone short-form assessment of chronic worry). According to Smith, McCarthy, and Anderson (2000), the lack of independence in administration can inflate the correlation between the short-form and full measure and misrepresent the measurement error associated with the short-form. Despite this limitation, the current study’s findings represent a “useful pilot step” in examining the cross-cultural invariance of the PSWQ-A between African American and European American young adults (Smith et al., 2000, p. 106). However, in light of this limitation in our study’s procedure, further research is needed before drawing firm conclusions from our preliminary findings. In particular, future studies should use separate administrations of the PSWQ-A and PSWQ with filler questionnaires given in between the two versions (Smith et al., 2000).

Moreover, the current study explored the psychometric properties of the PSWQ-A across ethnic subsamples using only measures of internal consistency, convergent validity, and discriminant validity; however, nascent findings suggests that the temporal stability of PSWQ-A scores is important to consider when using this measure as a screener for the presence of chronic worry in a nonclinical sample. A recent study by Spence, Blumenthal, and Brenes (2012) demonstrated that the PSWQ-A has good test–retest reliability (r = .86) in a college sample, but lacks within-trait stability over time. Particularly, researchers classified students as high versus low worriers based upon their PSWQ-A total scores at the initial assessment and found that many of the high worriers were no longer classifiable as such in subsequent assessments due to changes in their scores, which is interpreted by Spence and colleagues (2012) as evidence of within trait variability. Importantly, these findings highlight that while consistent shifts in scores over time within the overall sample may yield good test–retest reliability, differences in PSWQ-A scores for each participant between the assessment periods (e.g., temporal instability) may result in certain participants (particularly individuals with nonclinical worry) no longer meeting criteria for a previously specified trait-level of worry (e.g., low vs. high trait-based worry) at a second time point. Altogether, Spence and colleagues recommend that the PSWQ-A should be cautiously used as a trait-based measure of chronic worry in subclinical populations. Given that our study does not explore the test–retest reliability or temporal stability of PSWQ-A scores, future research should attempt to replicate the findings of Spence et al. (2012) in an ethnically diverse nonclinical.

Additionally, the present study only reflects self-reported worry in a sample of college students; therefore, future research should examine the partial measurement equivalence of the PSWQ-A in community and clinical samples to verify the relevance of this unidimensional model to the general and clinical population. Importantly, the current study provides further evidence supporting the lower endorsement of chronic worry in African Americans relative to European Americans. Upon the replication of our partially constrained one-dimensional model, future studies should utilize the PSWQ-A to explore cultural variables (e.g., cultural orientation, access to resources) that may mediate or moderate the relationship between ethnicity and chronic worry (assessed using the PSWQ-A). Also, upon the replication of the current study’s findings in ethnically diverse community-dwelling and clinical samples, future research should explore the clinical utility of the PSWQ-A in European American and African American samples, which will help determine if this abbreviated measure accurately identifies individuals at-risk for GAD across both ethnic subgroups. In particular, it would help inform the utility of this measure within research and clinical settings if future research identified specific cut-off scores for African Americans that account for their tendency to endorse lower scores on measures of chronic worry. Also, it is worth noting that African Americans who endorse clinically significant chronic worry tend to experience greater symptom severity relative European Americans (Himle et al., 2009). As such, future research should examine whether the PSWQ-A is able to capture the heightened severity of chronic worry among African Americans who are diagnosed with GAD.

Finally, the current study solely focused on cross-group differences within the context of ethnicity. However, extant literature has yet to examine the invariance of the PSWQ-A across genders. Specifically, within the current study, there was a larger female sampling, which may be a confound limiting the generalizability of our findings to males. In light of this limitation to the external validity of the current study, future research is needed to examine the measurement invariance of the PSWQ-A across genders. Along these lines, the current study only included a sampling of college students at a Midwestern university, which limits the generalizability of these findings to older adults. As such, further study is needed to verify whether the partial invariance of the one-factor structure of the PSWQ-A is applicable to the expression of worry in older adults.

Conclusions

Despite the limitations of this study, the results from the current investigation provide preliminary evidence that the PSWQ-A is a psychometrically sound assessment of chronic worry in an ethnically diverse college sample. More specifically, the current study informs our understanding of chronic worry cross-culturally by determining that the partially constrained single factor solution for the PSWQ-A can be used to acquire an accurate mean comparison and by providing further evidence that African Americans, on average, endorse less chronic worry than European American students. Altogether, these findings provide further support that the PSWQ-A is a viable option for a brief assessment of chronic worry.
as well as a possible strategy to enhance the time efficiency of the research and clinical assessments in ethnically diverse samples.

References


WORRY AND ETHNCITY


Received June 6, 2014
Revision received June 9, 2015
Accepted June 23, 2015