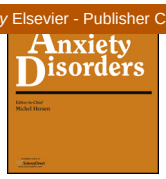
Journal of Anxiety Disorders 28 (2014) 657–663

Journal of Anxiety Disorders



Comparison of the Penn State Worry Questionnaire (PSWQ) and abbreviated version (PSWQ-A) in a clinical and non-clinical population of older adults

Viviana M. Wuthrich*, Carly Johnco, Ashleigh Knight

Centre for Emotional Health, Department of Psychology, Macquarie University, Sydney, Australia

ARTICLE INFO

Article history:
Received 21 March 2014
Received in revised form 24 June 2014
Accepted 4 July 2014
Available online 12 July 2014

Keywords:
PSWQ-A
Penn State Worry Questionnaire
Abbreviated
Geriatric
Older adult
Worry
Generalized Anxiety Disorder

ABSTRACT

The Penn State Worry Questionnaire (PSWQ) is a widely used measure of worry severity. An 8-item abbreviated version (PSWQ-A) has been developed as a brief screening measure, although there are limited studies assessing the psychometric properties of this measure in a large geriatric population. The aim of this study was to assess the utility of the PSWQ-A compared to the full PSWQ, to identify pathological worry in an older adult sample ($N = 108$) of clinically anxious and depressed older adults, compared to a non-clinical sample ($N = 53$). The PSWQ and PSWQ-A were found to have similarly adequate reliability and validity. The factor structure of the PSWQ-A was replicated, but not for the PSWQ. Both measures accurately distinguished between clinical and non-clinical status with similar sensitivity and specificity. These findings indicate the PSWQ-A is a useful measure for screening or epidemiological studies assessing worry in geriatric populations.

1. Introduction

Generalized Anxiety Disorder (GAD) is the most common anxiety disorder among treatment-seeking older adults (Beekman et al., 1998; Flint, 1994; Kessler et al., 2005; Wolitzky-Taylor, Castriotta, Lenze, Stanley, & Craske, 2010) and its core feature, worry is commonly reported among older populations (Beekman et al., 1998; Flint, 1994) as well as across a range of anxiety and mood disorders (McEvoy, Watson, Watkins, & Nathan, 2013; Kertz, Bigda-Peyton, Rosmarin, & Bjorgvinsson, 2012). Left untreated, geriatric anxiety is associated with increased functional and cognitive impairments, health care use, psychological distress and mortality (Beaudreau & O'Hara, 2008; Brenes et al., 2005; De Beurs et al., 1999; Nabi et al., 2010; Wetherell et al., 2004). As such, it is important for primary, secondary and tertiary health care providers to be able to reliably and validly measure worry as a basic, transdiagnostic characteristic of mental health problems in geriatric populations quickly and easily. The Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) is a widely used 16-item measure of worry severity, including five reverse scored items. The PSWQ has been shown to have adequate psychometric properties in younger samples, although there have been some concerns regarding the factor structure and usability with older adult samples. An abbreviated 8-item version of this measure has been developed (PSWQ-A; Hopko et al., 2003). The PSWQ-A shows promise as a useful brief screening measure that could be incorporated into routine screening of older adults in a variety of settings, or used for epidemiological research, although research validating the psychometric properties of this brief version with older adults is still emerging in large geriatric samples.

The full PSWQ, is one of the most commonly used measures of worry severity and has shown robust psychometric properties in student samples (Hazlett-Stevens, Ullman, & Craske, 2004; Meyer et al., 1990), non-clinical young adult samples (Knight, McMahon, Skeaff, & Green, 2008), and clinical young adult samples (Brown, Antony, & Barlow, 1992; Webb et al., 2008). In older adult samples, the PSWQ has also shown good internal consistency (alpha = .83; Stanley, Novy, Bourland, Beck, & Averill, 2001) and moderate convergent validity with other measures of anxiety (Crittendon & Hopko, 2006; Hopko et al., 2003). However, divergent validity from measures of depression in clinical samples of older adults are variable (Crittendon & Hopko, 2006; Hopko et al., 2003; Knight et al., 2008; Stanley et al., 2001), and it has been shown to have modest test–retest reliability over ten weeks, $r = .54$ (Stanley et al., 2001). A cut-off score of 50 on the PSWQ has been shown to accurately discriminate GAD from non-clinical samples with 82% sensitivity

* Corresponding author. Tel.: +61 29850 4866; fax: +61 29850 8062.
E-mail address: Viviana.Wuthrich@mq.edu.au (V.M. Wuthrich).

http://dx.doi.org/10.1016/j.janxdis.2014.07.005

and 90% specificity (Stanley et al., 2003), and from other psychiatric disorders with 78% sensitivity and 70% specificity (Webb et al., 2008).

Interestingly, one of the main differences between the properties of the PSWQ in older and younger samples is reflected in its factor structure. In younger samples, most research has demonstrated a single factor across student, community and clinical samples (Brown et al., 1992; Crittendon & Hopko, 2006; Knight et al., 2008; van Rijsoort, Emmelkamp, & Vervaeke, 1999), although one study using a student sample suggested a two factor solution (Fresco, Heimberg, Mennin, & Turk, 2002). This two factor solution is also commonly found with older adult samples (Beck, Stanley, & Zebb, 1995; Hopko et al., 2003). Interestingly, in the older adult samples, the second factor tends to be comprised predominantly of the reverse scored items of the PSWQ suggesting that its use may not be appropriate in older adults due to challenges responding to negatively worded items.

In order to improve the psychometric properties and factor structure of the PSWQ in older adults, Hopko et al. (2003) developed an abbreviated 8-item version (PSWQ-A) in an older GAD sample in which the reverse scored items, as well as some unreliable items were eliminated. This abbreviated version shows promise for use as a brief screening measure; however, studies of the psychometrics of this measure with older adults are still emerging. So far, the abbreviated version has been shown in both older adult community, and older GAD patients, to have acceptable test–retest reliability over 2–6 weeks (r = .63–.95), good discriminant validity to distinguish patients with GAD from other anxiety disorders, and convergent validity against other measures of anxiety (Crittendon & Hopko, 2006; Hopko et al., 2003; Knight et al., 2008; Stanley et al., 2003). Similar to the full PSWQ, evidence for the divergent validity of the PSWQ-A from measures of depression in older adults is less consistent with excellent divergent validity in a sample of older adults with GAD (Hopko et al., 2003) but poorer divergent validity in a community dwelling older adult sample (Crittendon & Hopko, 2006). The factor structure of the PSWQ-A has been demonstrated to have a one-factor solution in both younger and older non-clinical samples (Crittendon & Hopko, 2006; Knight et al., 2008) and in an older clinical sample with primary GAD (Hopko et al., 2003). More research is needed to confirm these findings in larger clinical and non-clinical samples of older adults.

Finally, the PSWQ-A has also been shown to be useful for identifying clinical levels of anxiety in older adult samples. A cut-off score of 23, was shown to be able to identify GAD in older adults compared to non-clinical older adults, with 82% specificity and 80% sensitivity (Stanley et al., 2011). Further, in older participants with anxiety disorders, the PSWQ-A has been shown to distinguish the presence of GAD from those without GAD with 79% sensitivity and 63% specificity, with slightly improved accuracy among those without comorbid depressive symptoms (Webb et al., 2008). One study comparing the PSWQ and PSWQ-A in older adults has suggested similar accuracy of the two measures to identify those with GAD from those without GAD (e.g., Webb et al., 2008). Therefore, the PSWQ-A appears to be promising as a screening measure for pathological worry in older adult samples.

However, to date, all studies examining the ability of the PSWQ-A to identify the presence of anxiety disorders have focused on the identification of GAD rather than an anxiety disorder more broadly (Stanley et al., 2003; Webb et al., 2008). Further, one of these studies (Stanley et al., 2003) utilized a relatively small sample size (GAD sample = 22 and comparison group = 10). Thus, an examination of the potential of the PSWQ-A as a screening measure for worry more generally across anxiety and mood disorders in large geriatric clinical and non-clinical samples is missing. Also given the high comorbidity between anxiety and depression in older adults (Beekman et al., 2000; De Beurs et al., 1999), there is limited research using the PSWQ-A as a screening measure for anxiety in a sample with comorbid depression, and more research in this area is needed.

This study sought to examine the utility of the PSWQ-A as a screening measure in a large older sample of clinically anxious and depressed older adults, and non-anxious and non-depressed older adults, and to compare the psychometric properties of this measure to the full PSWQ. We examined the factor structure of the two measures, convergent and divergent validity against geriatric measures of anxiety and depression, and examined the ability of these measures to discriminate the clinical group with comorbid anxiety and depression from the non-clinical sample. We also examined the differences in the ability of the PSWQ to distinguish older adults with primary anxiety disorder, and also primary GAD to the non-clinical sample.

2. Method

2.1. Participants

There was a total of 161 participants (103 female, age range = 60–86 years, M = 67.38, SD = 5.81) comprising two groups. The clinical sample (N = 108, female = 64, age range = 60–85, M = 67.33, SD = 5.76) were drawn from two randomized controlled trials for the treatment of anxiety and depression in older adults (Wuthrich & Rapee, 2013; Wuthrich, Rapee, Kangas, & Perini, 2014). Participants were recruited through advertisements in local papers seeking volunteers with worry, anxiety and low mood to participate in a treatment trial. Participants were included in this current study if they had both a DSM-IV (American Psychiatric Association, 2000) anxiety and unipolar mood disorder. Diagnosis was determined through use of the Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV; Di Nardo, Brown, & Barlow, 1994). Participants were excluded if they reported current self-harm or suicidal ideation, psychosis or bipolar disorder.

In the clinical sample, 61 participants had a primary anxiety disorder: Generalized Anxiety Disorder (34.5%), followed by Social Phobia (8.2%), Anxiety Disorder Not Otherwise Specified (7.3%), Post-Traumatic Stress Disorder (3.6%), Specific Phobia (1.8%) and Agoraphobia without Panic Disorder (1%), along with a secondary unipolar mood disorder. The remaining 47 participants had a primary unipolar mood disorder: Major Depressive Disorder (21.8%), Dysthymia (11.8%), Depressive Disorder Not Otherwise Specified (10%) along with a secondary anxiety disorder. Demographic characteristics are shown in Table 1.

The non-clinical sample (N = 53, female = 39, age range = 60–86 years, M = 67.49, SD = 6.08) came from a previous study on cognitive flexibility (Johnco, Wuthrich, & Rapee, 2013) and were recruited from advertisements in local newspapers seeking "happy healthy older adult volunteers". Participants were screened via telephone using the screening questions from the ADIS, and excluded if they reported experiencing anxiety, depression or any other mental health condition to a clinically significant degree. Participants' scores on the self-report measures of anxiety and depression all fell in the normal range (see Table 2).

2.2. Measures

Anxiety Disorders Interview Schedule (ADIS-IV; Di Nardo et al., 1994) is a semi-structured interview for diagnosing anxiety and related disorders according to DSM-IV criteria. Interviews were administered by post-graduate clinical psychology students who received training in its administration and had regular supervision. The interview assists clinicians to ascertain the presence and severity of disorders using a rating scale of 0–8, where ratings of

Table 1
Demographic data comparing clinical to non-clinical samples.

	Non-clinical	Clinical	Chi-square/*F*	Sig.
Age	*M* (*SD*)	*M* (*SD*)	.029	.867
	67.49 (6.082) (%)	67.32 (5.76) (%)		
Female	74	59	3.166	.083
Marital status			2.903	.715
Never married	3.8	3.7		
Married	52.8	50		
De Facto	3.8	3.7		
Separated	0	3.7		
Divorced	22.6	26.8		
Widowed	17.0	12.0		
Country born			5.854	.440
Australia	69.8	69.4		
England	15.1	6.48		
New Zealand	0	1.85		
Other	15.1	22.2		
Highest qualification			5.767	.330
Primary school	0	1.9		
Secondary school	22.6	20.37		
Certificate/trade certificate	13.2	19.44		
Diploma	15.1	25		
Bachelors degree	32.1	21.3		
Postgraduate degree	17.0	12.04		
Employment status			8.813	.184
Employed full time	5.7	7.41		
Employed part-time	37.7	23.1		
Retired	49.1	60.2		
Full time home duties	3.8	4.6		
Unable to work due to illness//injury	0	2.8		
Gross income (Australian $)			11.923	1.55
<$15,599 (%)	17.0	20.4		
$15,600–25,999 (%)	17.0	19.4		
$26,000–41,599 (%)	18.9	20.4		
$41,600–62,399 (%)	18.9	18.5		
$62,400–83,999 (%)	9.4	12.0		
>$84,000	13.2	8.3		
Not willing to answer	5.7	0		
Receiving a seniors pension	41.5	69.4	.870	.351

4 and above are considered of clinical severity. Only participants in the clinical sample completed the ADIS. Inter-rater reliability (*k*) for agreement on the presence of a disorder in the diagnostic profile was $k = 1.0$ (100% agreement) for mood disorder, $k = 1.0$ (100% agreement) for Generalized Anxiety Disorder and $k = .81$ (92% agreement) for social phobia.

Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990) is a 16 item measure of worry that has shown adequate internal consistency and convergent validity in elderly patients with GAD and controls (Beck et al., 1995; Stanley et al., 2001). However, some research suggests that the test–retest reliability (over ten weeks) is only moderate in older adult samples, $r = 54$ (Stanley et al., 2001).

Penn State Worry Questionnaire – Abbreviated (PSWQ-A; Hopko et al., 2003) is an abbreviated version of the PSWQ which contains 8 of the original items. The PSWQ-A has been shown to be highly correlated with the original measure, have good internal consistency, and convergent validity in older adult samples (Hopko et al., 2003). Although the test–retest reliability was still only moderate in the original sample, $r = 63$ (Hopko et al., 2003), it has been shown to be high in other older adult samples over 2 and 6weeks, $r = .92$ and .95 respectively (Crittendon & Hopko, 2006). In this study the scores for the PSWQ-A were extracted from the full version of the PSWQ (as done by Hopko et al., 2003) rather than both versions being administered separately.

Geriatric Depression Scale (GDS; Yesavage et al., 1983) is a 30 item self-report measure to determine the severity of depressive symptoms in older adults. It has high internal consistency, reliability, sensitivity and specificity (Jongenelis et al., 2005; Kieffer & Reese, 2002; Yesavage et al., 1983). In this sample, internal reliability was good for the total sample (alpha = .94), non-clinical sample (alpha = 79) and for the clinical sample (alpha = .82).

Geriatric Anxiety Inventory (GAI; Pachana et al., 2007) is a 20 item measure of anxiety symptom severity developed for older adults. It has been shown to have adequate internal consistency,

Table 2
Descriptive statistics for self-report measures for the clinical and non-clinical samples.

	Non-clinical Sample ($n = 53$)		Total clinical Sample ($n = 108$)		*F*-value
	Range	Mean (SD)	Range	Mean (SD)	
PSWQ	18–35	32.89 (9.17)	28–59	53.23 (11.88)	121.65**
PSWQ-A	8–14	13.49 (5.40)	12–35	25.20 (7.89)	98.27**
GAI	0–0	.60 (1.38)	2–16	10.45 (5.08)	191.67**
GDS	0–1	2.37 (2.93)	22–23	7.21 (6.28)	311.35**

Note: GAI, Geriatric Anxiety Inventory; GDS, Geriatric Depression Scale; PSWQ, Penn State Worry Questionnaire; PSWQ-A, Penn State Worry Questionnaire – Abbreviated Version; SD, standard deviation.

** $p < .001$.

Table 3
Correlations between self-report measures.

	PSWQ	PSWQ-A	GDS
Total sample			
GAI	.819**	.792**	.798**
GDS	.687**	.683**	
Clinical sample			
GAI	.700**	.664**	.488**
GDS	.295*	.345**	
Non-clinical sample			
GAI	.564**	.603**	.666**
GDS	.505**	.489**	

Note: GAI, Geriatric Anxiety Inventory; GDS, Geriatric Depression Scale; PSWQ, Penn State Worry Questionnaire; PSWQ-A, Penn State Worry Questionnaire – Abbreviated.
* $p \leq .05$.
** $p < .001$.

test–retest reliability and concurrent validity (Pachana et al., 2007). In this sample, internal consistency was good for the total sample (alpha = .94), non-clinical sample (alpha = 73) and clinical sample (alpha = .88).

2.3. Procedure

Ethics approval for all studies was gained from the Macquarie University Human Research Ethics Committee. All participants gave informed written consent to participate. Non-clinical participants completed the measures as part of another study (Johnco, Wuthrich, & Rapee, 2013). Clinical participants completed the measures as part of the initial assessment (prior to treatment) as part of two treatment studies (Wuthrich & Rapee, 2013; Wuthrich, Rapee, Kangas, & Perini, 2014). A subsample ($n = 22$) completed the PSWQ and PSWQ-A again after receiving no treatment for 12 weeks. Analyses were conducted using SPSS (Version 17) and STATA (Version 12.1).

3. Results

No significant differences were found between the non-clinical and clinical samples in regards to demographic characteristics (see Table 1). Means and standard deviations on the PSWQ, PSWQ-A, GAI, and GDS for each of the samples can be seen in Table 2. All assumptions of normality were met. One-way ANOVAs comparing the samples indicated that the clinical sample scored significantly higher on all measures than the non-clinical sample (see Table 2). The means and standard deviations of the PSWQ and PSWQ-A are similar to those reported in other studies.

The full PSWQ showed good internal consistency in the non-clinical sample (alpha = .87), clinical sample (alpha = .89) and total sample (alpha = .93). Given the PSWQ-A was extracted from the full PSWQ scale, it was unsurprising that there was a strong correlation between the two scales in the total, clinical and non-clinical samples ($r = .950$, .941, and .846 respectively). Correlations between the PSWQ and the geriatric measures of anxiety (GAI) and depression (GDS) are presented in Table 3. The PSWQ demonstrated a strong relationship with the GAI in the total and clinical samples, and a moderate relationship in the non-clinical sample. The PSWQ also correlated strongly with the GDS in the total sample and moderately in the clinical and the non-clinical samples. Steiger's z-score comparisons (Lee & Preacher, 2013) indicated that the correlation between the PSWQ and GAI was significantly stronger than the correlation between the PSWQ and GDS in the total ($z = 4.342$, $p < .001$) and clinical samples ($z = 5.152$, $p < .001$), but not the non-clinical sample ($z = .626$, $p = .531$). The results were similar for the PSWQ-A, with good internal consistency found in the non-clinical, clinical and total samples (alpha = .87, .91 and .94 respectively). Correlations between the PSWQ-A and the GAI and GDS are reported in Table 3 and demonstrate that the PSWQ-A was moderately correlated with the GAI and GDS in all samples. Comparisons indicated that the correlation between the PSWQ-A and GAI was significantly stronger than the correlation between the PSWQ-A and GDS in the total ($z = 3.423$, $p < .001$) and clinical samples ($z = 3.982$, $p < .001$), but not the non-clinical sample ($z = 1.230$, $p = .219$).

Test–retest reliability was examined using a subset of the clinical sample ($n = 22$) who were required to have no intervention for 12 weeks as part of the treatment trial (Wuthrich & Rapee, 2013). Adequate test–retest reliability was found for both the PSWQ ($r = 74$) and the PSWQ-A ($r = .70$) over a 12-week period.

Factor structure was tested with confirmatory factor analysis using the Analysis Moments of Structure program version 5 (Arbuckle, 1983–2010). Models were analyzed using the variance-covariance matrix. The fit of the models was tested by modeling the fit of the PSWQ onto both one and two factors for the PSWQ and one factor for the PSWQ-A separately. Maximum likelihood estimation was used and model significance was determined using the chi-square statistic, Bentler's (1990) CFI, Tucker Lewis Index (TLI: Tucker & Lewis, 1973), and Steiger's RSMEA (Steiger & Lind, 1980). The cutoff value for model significance was set at .95 for CFI and TLI, and .08 for RSMEA, and RSMEA was reported with a 90% confidence interval (CI). The one factor model for the PSWQ, χ^2 ($104, N = 161$) = 365.81, $p \leq .001$), had a poor fit (CFI = .861, TLI = .818, RSMEA = .125, 90% CI = .112–.140, AIC = 461.814). The two factor model for the PSWQ, χ^2 (103, $N = 161$) = 229.770, $p = <.001$, as described by Hopko et al. (2003) in which the reverse scored items formed a second factor, also resulted in an inadequate fit (CFI = .933, TLI = .911, RSMEA = .088, 90% CI = .073–.103, AIC = 327.770). This replicated Hopko et al.'s own results showing an inadequate fit of the two factor structure of the PSWQ in older adults and prompted the development of the PSWQ-A. Finally we tested the fit of a one factor model of the PSWQ-A, χ^2 (20, $N = 161$) = 31.50, $p = 05$,[1] and found that it produced a good fit on all indices (CFI = .99, TLI = .98, RSMEA = .06, 90% CI = .004–.098, AIC = 79.503).

Finally, we conducted a receiver operating characteristics (ROC) analysis in STATA Version 12. 1 (StataCorp., 2011) to determine the specificity and sensitivity of the PSWQ and PSWQ-A to correctly identify clinical disorder vs non-clinical status in the two samples (see Fig. 1). The accuracy of a diagnostic test is evaluated by the area under the ROC curve, with an area of 1 representing a perfect test and an area of .5 representing an inadequate test. The area under the curve for the PSWQ was .91 (SE = .02, $p < .001$; 95% CI = .86–.96), and for the PSWQ-A was .89 (SE = .03, $p < .001$, 95% CI = .82–.94) indicating that, based on a cut off of 50, the PSWQ could correctly identify clinical status with 61.5% sensitivity and 94.3% specificity, while a cut-off score of 23 on the PSWQ-A could correctly identify clinical status with 66.4% sensitivity and 92.5% specificity. There was a significant difference between these two curves, χ^2 (1) = 4.1, $p = <.05$, indicating that the PSWQ was significantly better at detecting clinical status. Kappa coefficients estimating relative agreement between clinical and community status are presented in Table 4, and indicate 48% agreement for PSWQ and 51% agreement for PSWQ-A.

Given the PSWQ is a measure of worry, we also examined whether it was more sensitive to identifying primary anxiety disorder status rather than a primary anxiety or mood disorder, and whether it was sensitive to distinguishing primary GAD from non-clinical status. Although all participants had both a mood and anxiety disorder (with either being primary), we examined the ROC

[1] The chi-square test (χ^2) indicates the amount of difference between expected and observed covariance matrices. Therefore a non-significant chi-square statistic is desirable.

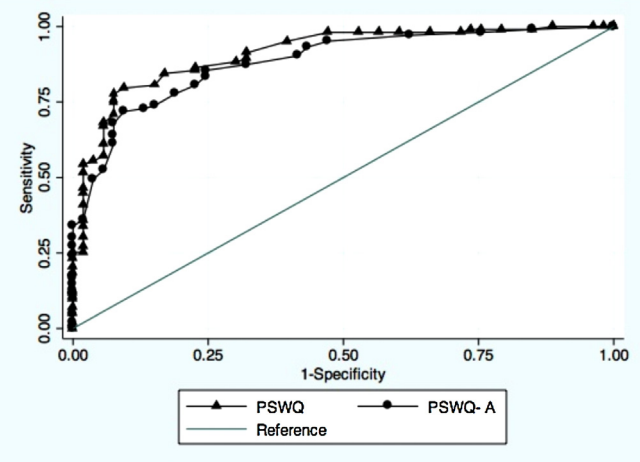


Fig. 1. Receiver operating characteristic analysis for the PSWQ and PSWQ-A using the clinical and non-clinical sample. *Note*: PSWQ, Penn State Worry Questionnaire; PSWQ-A, Penn State Worry Questionnaire – Abbreviated.

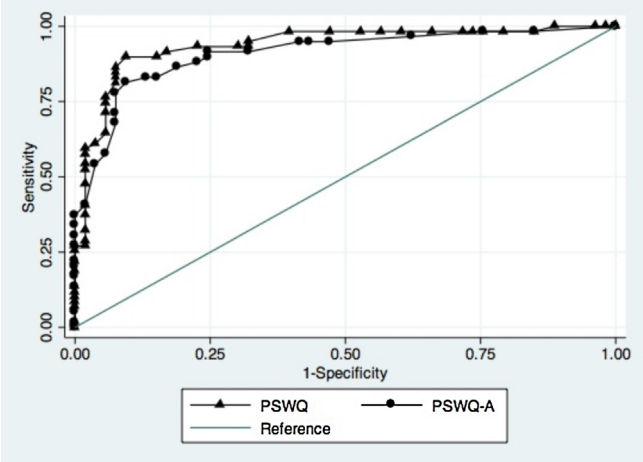


Fig. 2. Receiver operating characteristic analysis for the PSWQ and PSWQ-A using the primary anxiety disorder and non-clinical sample. *Note*: PSWQ, Penn State Worry Questionnaire; PSWQ-A, Penn State Worry Questionnaire – Abbreviated.

curves for the 61 participants in the sample with a primary anxiety disorder, and the 37 participants with primary GAD, to the non-clinical sample. Overall the results indicated that the PSWQ and PSWQ-A were able to identify those with primary anxiety disorder, and those with primary GAD, from the community sample well. The ROC results indicated that the PSWQ could accurately identify clinical status (based on a cut off of 50) in the primary anxiety sample with 71.7% sensitivity and 99.9% specificity, ROC = .94, SE = .02, 95% CI = .89–.98. In addition, the PSWQ-A (based on a cut off of 23) could identify primary anxiety disorder with 77.0% sensitivity and 92.5% specificity, ROC = .91, SE = .03, 95% CI = .85–.96. The difference between the two ROC analyses was not significant, χ^2 (1) = 3.3, p = 07, indicating little difference between the PSWQ and PSWQ-A in identifying those with a primary anxiety disorder (see Fig. 2). Kappa coefficients estimating relative agreement between ADIS diagnoses and the PSWQ and PSWQ-A cases based on cut-off scores are presented in Table 4 and indicate 65% agreement for PSWQ and 69% agreement for PSWQ-A. Similarly, the PSWQ accurately identified primary GAD status compared to non-clinical sample (sensitivity 72.2%, specificity 94.3%, Kappa = .69, ROC = .95, SE = .02, 95% CI = .91–.99) as did the PSWQ-A (sensitivity 75.7%, specificity 92.5%, Kappa .70, ROC = .91, SE = .03, 95% CI = .86–.97). The difference between the two ROC analyses for identifying primary GAD was significant, χ^2 (1) = 4.05, p < 05, indicating the PSWQ was significantly better at detecting the presence of primary GAD compared to the PSWQ-A.

4. Discussion

This study examined the psychometric characteristics of the PSWQ and PSWQ-A, in a clinical geriatric sample with comorbid anxiety and mood disorders and a non-clinical sample to establish the utility of the PSWQ-A as a screening measure for pathological worry and for the presence of GAD in older adults. The results demonstrated adequate internal consistency of both the PSWQ and PSWQ-A in older adult non-clinical and clinical samples, along with good test–retest reliability of the PSWQ and PSWQ-A over a 12-week period, adding to the limited literature on test–retest reliability. Our results found evidence of strong convergent validity between both the PSWQ and PSWQ-A with the GAI, and moderate relationships with the GDS mirroring previous findings in geriatric community and clinically anxious samples (Crittendon & Hopko, 2006; Hopko et al., 2003; Stanley et al., 2001). Results suggested that the convergent validity was stronger between the PSWQ and a geriatric measure of anxiety (GAI) compared to the relationship with a geriatric measure of depression (GDS) in the total and clinical samples, although there was no difference in this relationship in the non-clinical sample. The moderate overlap between the PSWQ and GDS was mirrored between the GAI and GDS and is likely to reflect the overlapping constructs of anxiety and depression generally. Our results from the factor analyses matched the failure by Hopko et al. (2003) to find an adequate fit of either one or two factor models of the PSWQ in older adults, suggesting a more problematic factor structure of the full scale with older adults. However, our results did demonstrate a good fit of a one factor solution of the PSWQ-A in older adults, replicating previous research (Crittendon & Hopko, 2006; Hopko et al., 2003).

In addition, we compared the ability of the PSWQ and PSWQ-A to correctly categorize clinically anxious and depressed older adults from non-clinical older adults, and to discriminate primary GAD from the non-clinical sample. The results indicated that in the total

Table 4
Sensitivity, Specificity and Kappa values for the PSWQ and PSWQ-A.

Sample	Measure	AUC (SE)	Sensitivity	Specificity	Kappa
Total clinical vs non-clinical (n = 161)	PSWQ	.91 (.02)	61.5	94.3	.48**
	PSWQ-A	.89 (.03)	66.4	92.5	.51**
Primary anxiety disorder vs non-clinical (n = 114)	PSWQ	.94 (.02)	71.7	99.9	.65**
	PSWQ-A	.91 (.03)	77.0	92.5	.69**
Primary GAD vs non-clinical (n = 90)	PSWQ	.95 (.02)	72.2	94.3	.69**
	PSWQ-A	93(.03)	75.7	92.5	.70**

Note: AUC, Area under the curve; PSWQ, Penn State Worry Questionnaire; PSWQ-A, Penn State Worry Questionnaire – Abbreviated; SE, standard error; GAD, Generalized Anxiety Disorder.
** p < 001.

sample, both the PSWQ and the PSWQ-A were able to distinguish clinical status with good sensitivity and specificity. The PSWQ-A was found to accurately categorize primary anxiety disorder status from non-clinical status with good sensitivity (77.0%) and specificity (92.5%), and similarly primary GAD from non-clinical status with good sensitivity (75.7%) and specificity (92.5%). However, the results also indicated that the PSWQ and PSWQ could accurately categorize comorbid clinical anxiety and depression more generally from non-clinical status with 66.4% sensitivity and 92.5% specificity. These results fit with the emerging research showing that pathological worry or negative thinking generally may be a transdiagnostic construct that is associated with a range of anxiety and mood disorders (Kertz et al., 2012; McEvoy et al., 2013). Therefore the PSWQ and PSWQ-A can be used as measures sensitive to pathological worry or negative thinking more generally across anxiety and mood disorders as well as GAD, at least in older adult samples.

The ROC analysis indicated that the PSWQ explained significantly more variance under the curve than the PSWQ-A when comparing clinical anxiety or depression with the non-clinical sample, and when comparing primary GAD to the non-clinical sample, although there was no significant difference when comparing participants with primary anxiety disorder to the non-clinical sample. Although the full PSWQ was found to be significantly better in two of these comparisons, the sensitivity and specificity achieved by the PSWQ-A in these categorizations was still adequate and therefore the PSWQ-A is useful as a screening measure.

Our results indicate the main difference between the PSWQ and PSWQ-A favored the factor structure in the PSWQ-A; however, the full PSWQ showed slightly superior ability to identify those with pathological worry. Given the good and comparable psychometric properties of the PSWQ-A compared to the full PSWQ, this brief measure is adequate and would likely be useful for epidemiological or screening purposes. While previous studies have included a proportion of participants with comorbid mood disorders, comorbidity is common in older adult samples (Beaudreau & O'Hara, 2008; Beekman et al., 2000; De Beurs et al., 1999) and the comparable psychometric performance of the PSWQ-A in our comorbid sample further supports the use of this measure for identifying pathological worry in geriatric populations.

There are several limitations of this study that need to be considered. Firstly, the scores for the PSWQ-A were derived from the full version of the PSWQ (as previously done by Hopko et al., 2003) and so comparisons between the measures needs to be interpreted with caution. Crittendon and Hopko (2006) administered the PSWQ and PSWQ-A separately in their study, and they reported only a moderate correlation between the two measures ($r = .65$), suggesting potential variability in responses across the two different administrations or differences in what is measured in the two scales. This contrasts with our strong correlations between the two measures when derived from the same administration ($r = .85–.95$). However, by extracting the PSWQ-A in this way, it allowed direct comparison between the measures when interpreting ROC analyses as we are able to make conclusions about whether using only the abbreviated version is superior, without being confounded by variability caused by having administered the two measures separately. Further, it is a limitation that the non-clinical sample did not receive the full diagnostic interview. Therefore it is possible that some of the non-clinical sample might have met criteria for a clinical disorder. Finally, given the significant changes to the structure of the disorder categories in DSM-5, these results apply to anxiety disorders as listed in the DSM-5, but also Post-Traumatic Stress Disorder (PTSD) which is now classed in a new category. Although our sample of participants with PTSD was small and so more research is needed in this disorder. Finally, although we did not exclude participants with Obsessive Compulsive Disorder (OCD), there were no participants with OCD in our sample, and so more research is needed in this class of disorders.

Overall our results indicated that the reliability and validity of the PSWQ and PSWQ-A was similar. The ability for the PSWQ and PSWQ-A to identify clinical status and the presence of primary GAD was similar, although slightly favored the PSWQ. Given the superior factor structure of the PSWQ-A, and that this abbreviated version closely mimics the psychometric properties of the full version, the PSWQ-A shows promise as a good measure for screening or epidemiological purposes for identifying pathological worry across anxiety and mood disorders in older adult samples.

Ethical approval

All authors have agreed to authorship in the above indicated order. This research was approved by the Macquarie University Human Ethics Committee.

Funding

None.

References

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: Author.

Arbuckle, J. L. (1983–2010). *Analysis of moments structures (Ver. 19)*. US: Meadville.

Beaudreau, S. A., & O'Hara, R. (2008). Late-life anxiety and cognitive impairment: a review. *American Journal of Geriatric Psychiatry*, *16*(10), 790–803. http://dx.doi.org/10.1097/JGP.0b013e31817945c3

Beck, J. G., Stanley, M. A., & Zebb, B. J. (1995). Psychometric properties of the Penn State Worry Questionnaire in older adults. *Journal of Clinical Geropsychology*, *1*, 33–42. http://link.springer.com/journal/10873

Beekman, A. T., Bremmer, M. A., Deeg, D. J., van Balkom, A. J., Snut, J. H., de Beurs, E., & van Tilburg, W. (1998). Anxiety disorders in later life: a report from the Longitudinal Aging Study Amsterdam. *International Journal of Geriatric Psychiatry*, *13*(10), 717–726, doi:http://dx.doi.org/10.1002/%28SICI%291099-1166%281998100%2913:10%3C717::AID-GPS857%3E3.0.CO;2-M.

Beekman, A. T., de Beurs, E., van Balkom, A. J., Deeg, D. J., van Dyck, R., & van Tilburg, W. (2000). Anxiety and depression in later life: co-occurrence and communality of risk factors. *American Journal of Psychiatry*, *157*(1), 89–95, doi:http://ajp.psychiatryonline.org/data/Journals/AJP/3708/89.pdf.

Bentler, P. M. (1990). Comparative fit indicies in structural models. *Psychological Bulletin*, *107*, 238–246.

Brenes, G. A., Guralnik, J. M., Williamson, J. D., Fried, L. P., Simpson, C., Simonsick, E. M., & Penninx, B. W. (2005). The influence of anxiety on the progression of disability. *Journal of the American Geriatrics Society*, *53*(1), 34–39. http://dx.doi.org/10.1111/j.1532-5415.2005.53007.x

Brown, T. A., Antony, M. M., & Barlow, D. H. (1992). Psychometric properties of the Penn State Worry Questionnaire in a clinical anxiety disorders sample. *Behaviour Research and Therapy*, *30*(1), 33–37, doi:http://dx.doi.org/10.1016/0005-7967%2892%2990093-V.

Crittendon, J., & Hopko, D. R. (2006). Assessing worry in older and younger adults: psychometric properties of an abbreviated Penn State Worry Questionnaire (PSWQ-A). *Journal of Anxiety Disorders*, *20*(8), 1036–1054. http://dx.doi.org/10.1016/j.janxdis.2005.11.006

De Beurs, E., Beekman, A., van Balkom, A., Deeg, D., van Dyck, R., & van Tilburg, W. (1999). Consequences of anxiety in older persons: its effect on disability, well-being and use of health services. *Psychological Medicine: A Journal of Research in Psychiatry and the Allied Sciences*, *29*(3), 583–593. http://dx.doi.org/10.1017/S0033291799008351

Di Nardo, P. A., Brown, T. A., & Barlow, D. H. (1994). *Anxiety Disorders Interview Schedule for DSM-IV*. Boston: Center for Stress and Anxiety Related Disorders, Boston University.

Flint, A. J. (1994). Epidemiology and comorbidity of anxiety disorders in the elderly. *American Journal of Psychiatry*, *151*(5), 640–649, http://ajp.psychiatryonline.org/journal.aspx?journalid=13.

Fresco, D. M., Heimberg, R. G., Mennin, D. S., & Turk, C. L. (2002). Confirmatory factor analysis of the Penn State Worry Questionnaire. [empirical study]. *Behaviour Research and Therapy*, *40*(3), 313–323, doi:http://dx.doi.org/10.1016/S0005-7967%2800%2900113-3.

Hazlett-Stevens, H., Ullman, J. B., & Craske, M. G. (2004). Factor structure of the Penn State Worry Questionnaire: examination of a method factor. *Assessment*, *11*(4), 361–370. http://dx.doi.org/10.1177/1073191104269872

Hopko, D. R., Reas, D. L., Beck, J., Stanley, M. A., Wetherell, J. L., Novy, D. M., & Averill, P. M. (2003). Assessing worry in older adults: confirmatory factor analysis of the Penn State Worry Questionnaire and psychometric properties of an abbreviated model. *Psychological Assessment*, *15*(2), 173–183. http://dx.doi.org/10.1037/1040-3590.15.2.173

Johnco, C., Wuthrich, V. M., & Rapee, R. M. (2013). The role of cognitive flexibility in cognitive restructuring skill acquisition among older adults. *Journal of Anxiety Disorders*, http://dx.doi.org/10.1016/j.janxdis.2012.10.004

Jongenelis, K., Pot, A., Eisses, A., Gerritsen, D., Derksen, M., Beekman, A., & Ribbe, M. (2005). Diagnostic accuracy of the original 30-Item and shortened versions of the Geriatric Depression Scale in nursing home patients. *International Journal of Geriatric Psychiatry*, *20*(11), 1067–1074, doi:http://dx.doi.org/10.1002/gps.1398.

Kertz, S. J., Bigda-Peyton, J. S., Rosmarin, D. H., & Bjorgvinsson, T. (2012). The importance of worry across diagnostic presentations: prevelance, severity and associated symptoms in a partial hospital setting. *Journal of Anxiety Disorders*, *26*, 126–133. http://dx.doi.org/10.1016/j.janxdis.2011.10.005

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national comorbidity survey replication. *Archives of General Psychiatry*, *62*(6), 593–602, doi:http://dx.doi.org/10.1001/archpsyc.62.6.593.

Kieffer, K. M., & Reese, R. J. (2002). A reliability generalization study of the Geriatric Depression Scale. *Educational and Psychological Measurement*, *62*(6), 969–994, doi:http://dx.doi.org/10.1177/0013164402238085.

Knight, R. G., McMahon, J., Skeaff, C., & Green, T. J. (2008). Normative data for persons over 65 on the Penn State Worry Questionnaire. *New Zealand Journal of Psychology*, *37*(1), 4–9, doi:http://www.psychology.org.nz/NZ_Journal.

Lee, I. A., & Preacher, K. J. (2013, September). *Calculation for the test of the difference between two dependent correlations with one variable in common*. Available from. http://quantpsy.org

McEvoy, P. M., Watson, H., Watkins, E. R., & Nathan, P. (2013). The relationship between worry, rumination, and comorbidity: evidence for repetitive negative thinking as transdiagnostic construct. *Journal of Affective Disorders*, *151*, 313–320. http://dx.doi.org/10.1016/j.jad.2013.06.014

Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy*, *28*(6), 487–495. http://dx.doi.org/10.1016/0005-7967(90)90135-6

Nabi, H., Hall, M., Koskenvuo, M., Singh-Manoux, A., Oksanen, T., Suominen, S., & Vahtera, J. (2010). Psychological and somatic symptoms of anxiety and risk of coronary heart disease: the health and social support prospective cohort study. *Biological Psychiatry*, *67*(4), 378–385. http://dx.doi.org/10.1016/j.biopsych.2009.07.040

Pachana, N. A., Byrne, G. J., Siddle, H., Koloski, N., Harley, E., & Arnold, E. (2007). Development and validation of the Geriatric Anxiety Inventory. *International Psychogeriatrics*, *19*(1), 103–114. http://dx.doi.org/10.1017/S1041610206003504

Stanley, M. A., Diefenbach, G. J., Hopko, D. R., Novy, D. M., Kunik, M. E., Wilson, N., & Wagener, P. (2011). Erratum to: the nature of generalized anxiety in older primary care patients: preliminary findings. *Journal of Psychopathology and Behavioral Assessment*, *33*, 298. http://dx.doi.org/10.1007/s10862-011-9221-1

Stanley, M. A., Diefenbach, G. J., Hopko, D. R., Novy, D. M., Kunik, M. E., Wilson, N., & Wagener, P. (2003). The nature of generalized anxiety in older primary care patients: preliminary findings. *Journal of Psychopathology and Behavioral Assessment*, *25*(4), 273–280. http://dx.doi.org/10.1023/A:1025903214019

Stanley, M. A., Novy, D. M., Bourland, S. L., Beck, J., & Averill, P. M. (2001). Assessing older adults with generalized anxiety: a replication and extension. *Behaviour Research and Therapy*, *39*(2), 221–235, doi:http://dx.doi.org/10.1016/S0005-7967%2800%2900030-9.

Steiger, J. H., & Lind, J. C. (1980). *Statistically based tests for the number of common factors*. Iowa City, Iowa: Paper presented at the Annual Meeting of Psychometric Society.

Tucker, L. R., & Lewis, C. (1973). The reliability coefficient for maximum likelihood factor analysis. *Psychometrika*, *38*, 1–10. http://dx.doi.org/10.1007/bf02291170

van Rijsoort, S., Emmelkamp, P., & Vervaeke, G. (1999). The Penn State Worry Questionnaire and the Worry Domains Questionnaire: structure, reliability and validity. *Clinical Psychology & Psychotherapy*, *6*(4), 297–307, doi:http://dx.doi.org/10.1002/%28SICI%291099-0879%28199910%296:4%3C297::AID-CPP206%3E3.0.CO;2-E.

Webb, S. A., Diefenbach, G. J., Wagener, P., Novy, D. M., Kunik, M. E., Rhoades, H. M., & Stanley, M. A. (2008). Comparison of self-report measures for identifying late-life generalized anxiety in primary care. *Journal of Geriatric Psychiatry and Neurology*, *21*(4), 223–231. http://dx.doi.org/10.1177/0891988708324936

Wetherell, J. L., Thorp, S. R., Patterson, T. L., Golshan, S., Jeste, D. V., & Gatz, M. (2004). Quality of life in geriatric generalized anxiety disorder: a preliminary investigation. *Journal of Psychiatric Research*, *38*(3), 305–312. http://dx.doi.org/10.1016/j.jpsychires.2003.09.003

Wolitzky-Taylor, K. B., Castriotta, N., Lenze, E. J., Stanley, M. A., & Craske, M. G. (2010). Anxiety disorders in older adults: a comprehensive review. *Depression and Anxiety*, *27*(2), 190–211. http://dx.doi.org/10.1002/da.20653

Wuthrich, V. M., & Rapee, R. M. (2013). Randomised controlled trial of group cognitive behavioural therapy for comorbid anxiety and depression in older adults. *Behaviour Research and Therapy*, *51*, 779–786.

Wuthrich, V. M., Rapee, R. M., Kangas, M., & Perini, S. (2014). *Comparison of group cognitive behavioural therapy to a discussion group in older adults with comorbid anxiety and depression*. (in preparation).

Yesavage, J. A., Brink, T. L., Rose, T. L., Lum, O., Huang, V., Adey, M., & Leirer, V. O. (1983). Development and validation of a Geriatric Depression Screening Scale: a preliminary report. *Journal of Psychiatric Research*, *17*(1), 37–49, doi:http://dx.doi.org/10.1016/0022-3956%2882%2990033-4.