



Psychometric properties of internet administered versions of Penn State Worry Questionnaire (PSWQ) and Depression, Anxiety, and Stress Scale (DASS)

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ABSTRACT

A limited amount of research has been conducted on the psychometric properties of commonly used measures of anxious or depressive symptomatology for use on the internet, although such measures are seeing increasing use in internet administration for both clinical and research uses. A plethora of advantages exist for the use of internet administration of questionnaires, both in terms of assessment and the potential use in treatment monitoring as well as for research. The aim of this study was to examine the psychometric properties of two common clinical measures, the Penn State Worry Questionnaire and the Depression, Anxiety, and Stress Scale, in an internet administered format ($N = 1138$). Results suggest that these two measures may be used with confidence in an online format in terms of reliability and validity.

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1. Introduction

The development and acceptance of internet technology has coincided with the emergence of internet-based questionnaire administration as a means of gathering psychological information. Community access to the internet has offered new opportunities in terms of assessing and treating mental disorders (Kobak, Reynolds, Rosenfeld, & Greist, 1990) and has opened a new frontier for research and data collection (Coles, Cook, & Blake, 2007). The United States Department of Commerce (2002) reported that 54% of all US citizens have access to the internet from their home. Further, research has found that one quarter of Americans with home internet access have used the internet for information on mental health conditions (Pew Internet, 2003). There are many obvious advantages to internet administration of psychological instruments including ease and comfort of administration, simplicity of data collection, computer facilitated scoring, as well as reduced cost and increased opportunity for researchers and clinicians to access larger and potentially more diverse populations (Coles et al., 2007; Naglieri et al. 2006; Reips, 2000; Schmidt, 1997). Other advantages to web-based data collection include lower social anxiety or socially desirable responding demonstrated by participants (Joinson, 1999). Naglieri et al. (2006) suggest that although the use of the internet for psychological testing and assessment presents a number of advantages and benefits to both clinicians and researchers, it is not without its potential risks. For example, the implications a test has for an individual test taker may influence his/

response style in a manner similar to that of paper-and-pencil measures.

Research on internet administration of self-report inventories suggest that reliable and valid data are gathered (Buchanan, 2000) and that psychometric properties of traditional measures are typically replicated although not identical (Buchanan, 2000) to paper-and-pencil formats. When data has been available for paper-and-pencil versions of online instruments, research has shown that the online measures do assess the same constructs as the traditional paper versions (Davis, 1999). In cases of instruments which have only an internet version available, there is evidence that the online measures possess construct validity (Buchanan, 2000; Buchanan & Smith, 1999) in that they measure the traits proposed. Although there is evidence to suggest that online measures of psychological traits are valid and reliable, other research does suggest that the psychometric properties of the measure may change when administered via the web (Buchanan, 2000, 2001). Naglieri et al. (2006) suggest that internet administration of psychological tests and measures lends itself to the use of Item Response Theory (IRT; Hambleton & Swaminathan, 1985). Interactive and fluid assessments through the internet can be tailored to the individual test-takers responses providing efficient and appropriate assessment. For example, an individual completing a measure of mental health may answer positively to a question querying depressive symptoms and additional questions screening for significant symptoms of depression will subsequently be presented whereas the individual denies a prominent symptom of psychosis and further questions on psychotic disorders are not presented. Overall, the research on internet administered self-report questionnaires suggest that the measures may be reliable and valid, but psychometric properties of web-based

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versions should not necessarily be assumed to be equivalent to paper-and-pencil counterparts.

The aim of this study was to examine the preliminary psychometric properties and normative data for the internet administered versions of two commonly used measures of depression and anxiety, the Penn State Worry Questionnaire (PSWQ) and the Depression, Anxiety, and Stress Scale (DASS). It was hypothesized that the psychometric properties of the measures (i.e. means, standard deviations, and reliability) would be similar to published reports utilizing traditional paper-and-pencil versions of the measures.

2. Methods

2.1. Participants and procedure

Participants in this study were 1138 undergraduate students at a large Southern University. Participants ranged in age from 18 to 41 years ($M = 20.16$ years, $SD = 2.01$ years). Seventy-three percent of the participants were female and 83% were Caucasian. Ten percent of the sample was African-American, in line with the reported demographic make-up of the larger university community.

Participants were undergraduate students enrolled in psychology courses at a large university. Study recruitment was conducted through multiple avenues, including the psychology department experiment pool and classroom announcements. The consent process and questionnaire completion was available and fully conducted in an online format through a data collection system which enabled students to log in and out using a password on a secure system. Participants completed an informed consent online prior to participating in the study and were debriefed electronically following their participation. Seventy-five percent of participants completed the questionnaire administration in two hours or less. This study and the online consenting procedure received approval from the university's internal review board including approval from the human subjects committee.

2.2. Measures

2.2.1. Depression, Anxiety, and Stress Scale (Lovibond & Lovibond, 1995)

The DASS is a 42-item self-report that assesses symptoms of depression, anxiety, and stress in adults and adolescents. All items are rated on a four-point Likert-type scale from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time) according to how often particular symptoms were experienced in the past week. The DASS has demonstrated good internal consistency, ranging from .84 (Anxiety subscale) to .91 (Depression subscale) and acceptable test-retest reliability (Lovibond & Lovibond, 1995).

2.2.2. Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990)

The PSWQ is a 16-item self-report of excessive and uncontrollable worry in adults. All items are rated on a five-point Likert-type scale ranging from 1 (not at all typical of me) to 5 (very typical of me). The PSWQ possesses high internal consistency ($\alpha = .86-.95$) and test-retest reliability ($r = .74-.93$; Molina & Borkovec, 1994). Additionally, research has demonstrated that the PSWQ has good convergent and divergent validity (Molina & Borkovec, 1994).

3. Results

3.1. Reliability

Cronbach's alpha was computed to provide an estimate of the internal consistency for the DASS subscales and the PSWQ. Excellent internal consistency was found for the subscales of the DASS

(depression $\alpha = .95$; anxiety $\alpha = .93$; stress $\alpha = .94$) whereas the PSWQ demonstrated acceptable internal consistency ($\alpha = .73$). One hundred and fifteen participants completed the PSWQ and the DASS 6 weeks after the initial administration to assess the test-retest reliability of the internet format. The test-retest reliability for the measures suggests that scores obtained on the DASS and PSWQ when administered in an online format statistically reliable across a six week time span ($r = .57-.67$, $p < .001$) although did not reach accepted levels of test-retest reliability ($r = .70$). Given that the measures assess the participants' emotional state during the past one week, the lower level reliability was expected due to the changing nature of the construct. See Table 1 for test-retest reliability statistics.

3.2. Correlations

The subscales of the DASS were highly inter-related ($r = .79-.83$, $p < .01$). Additionally, the DASS subscales demonstrated significant correlations with the PSWQ at the $p < .001$ level (Stress $r = .49$, Anxiety $r = .32$, Depression $r = .28$). Table 1 displays the Pearson correlation coefficients for the PSWQ and subscales of the DASS.

3.3. Normative data

To facilitate comparisons of future use of the DASS and PSWQ in internet administered form with scores from the current sample, means and standard deviations of the scales scores were calculated following scoring rules provided by measure authors (i.e. Lovibond & Lovibond, 1995; Meyer et al., 1990). These were as follows: PSWQ, $M = 62.60$ ($SD = 12.31$), DASS-Stress, $M = 12.18$ ($SD = 8.96$); DASS-Anxiety, $M = 7.79$ ($SD = 8.17$), DASS-Depression, $M = 8.50$ ($SD = 8.60$). Effect size calculations (Cohen's d) indicated that obtained means from the current sample were similar to published reports (Lovibond & Lovibond, 1995) for the DASS ($d = .17-.64$). On the other hand, the mean obtained through the current administration of the PSWQ indicated a large effect size ($d = -1.06$) as compared to data reported by Buhr and Dugas (2006).

4. Discussion

Overall, the results of this study suggest that internet administered versions of the PSWQ and the DASS demonstrate good internal consistency and inter-scale correlations in line with published research. Additionally, for the DASS, means and standard deviations for the internet administered questionnaire were not significantly different from published properties of paper-and-pencil forms. A discrepancy was revealed in the obtain test-retest reliability for the current sample as compared to published research. A major departure of this study from other research reports on the psychometric properties of the DASS and PSWQ was in the length of time between administrations of the measure (1–2 weeks vs. 6 weeks). Brown, Chorpita, Korotitsch, and Barlow (1997) reported 2-week reliability of the DASS to range from 0.71 to 0.81. Again, the current administrations were spaced at a 6-week interval. Low-

Table 1
Measure and subscale correlations

	Test-retest	DASS-stress	DASS-anxiety	DASS-depression
PSWQ	.67 ^a	.49 ^a	.32 ^a	.28 ^a
DASS-Stress	.57 ^a		.80 ^a	.79 ^a
DASS-Anxiety	.66 ^a			.83 ^a
DASS-Depression	.66 ^a			

Note. PSWQ: Penn State Worry Questionnaire; DASS: Depression, Anxiety, and Stress Scale.

^a $p < .001$.

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