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Mood change and computer anxiety: A comparison between computerised and paper measures of negative affect

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Abstract

The lack of equivalence between computerized and pencil-and-paper administration in measures of negative affect have been attributed to variance created by negative affect towards computers or computer anxiety (CA). In the current study, paper baseline computer anxiety and state/trait anxiety measures were obtained from 51 first-year psychology undergraduate volunteers. Further measures were taken by either paper or computer before and after students received their grade for the first research methods practical report of the course. Levels of state anxiety (SA) were found to increase significantly at this time. A lexical decision task was completed at each measurement stage as an additional behavioural mood indicator. Results revealed that CA was only related to SA prior to receipt of grade, at a point where equivalence between administration method of measures had been demonstrated. Non-equivalence in measurement of SA occurred after students had received their mark, in that levels of anxiety increased in the computer condition and decreased in the paper condition. Lack of equivalence, therefore, appears to be a function of psychological stress, characterised by affective modulation rather than CA.
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Keywords: Computer anxiety; Computerized mood measurement; Equivalence

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1. Introduction

The advantages of using computers for psychological assessment are extensive. Automatic scoring, compatibility with data analysis software, report generation and the facility to accurately time responses offer potential financial savings in professional time. For example, computerized adaptive testing has been found to require 50% fewer items to reach dependable results (Haladyna & Roid, 1983). Computerized testing procedures have been well accepted in clinical settings (Klinger, Johnson, & Williams, 1976; Weber et al., 2003). In education, Bugbee (1996) reviewed findings of the American College, which offers graduate degree distance education. This showed that students do at least as well on computer based tests as on paper-and-pencil tests, students like computer based tests and although students took more time to complete computer based tests than paper-and pencil tests, they believed computerized versions saved time. Other studies, however, have raised questions about equivalence of computerized versions of tests with those originally developed in paper-and-pencil format (Gallagher, Bridgeman, & Cahalan, 2000; Korbrin & Young, 2003; McDonald, 2002).

Equivalence in computerized versions of existing measurement scales is dependent on demonstrating that the computerized version of the test remains reliable and valid to a standard comparable to the original paper-and-pencil measure (International Test Commission, 2005). In order to meet current standards of test development, test developers of computerized versions of paper-and-pencil tests should be able to demonstrate equivalence in test reliability, correlations with other tests demonstrating validity and approximation of means and standard deviations across testing modes (see also American Psychological Association, 1986, Hofer & Green, 1985). Whilst statistical equivalence of scoring in different modes of testing is undoubtedly important with respect to test reliability and validity, this may not be sufficient to ensure unequivocal test equivalence. McDonald (2002) argues that presentation of a test on a computer creates a qualitatively different testing experience legitimating and necessitating the investigation of individual differences in test experience as a valid factor in equivalence studies.

Research assessing the equivalence of computerized measures has yielded equivocal results. Bunderson, Inouye, and Olsen (1989) found that about half the studies they reviewed indicated equivalence of computerized tests and paper based tests. Specifically, three studies showed computer based tests produced higher scores than paper-based tests, nine studies showed computer based tests produced lower scores than paper based tests and 11 studies found no statistical difference between the two versions.

Early research attributed the variance recorded between administration modality to the physical properties of the computer. Green (1988) suggested that differences relating to computer based tests that were considered to affect construct validity and equivalence were a function of either software or hardware limitations. Whilst technological factors are still considered, more recently emphasis has shifted to the identification of psychological and participant factors that may be implicated in a threat to equivalence (Leeson, 2006; McDonald, 2002). Computer familiarity (Taylor, Kirsch, Jamieson, & Eignor, 1999), computer self-efficacy (Barbeite & Weiss, 2004), attitudes to computers (Durnell & Haag, 2002) and negative affect towards computers (Smith & Caputi, 2001) have all been investigated as potential mediators of non-equivalence.

Aversion to computers or computer anxiety (CA) has been defined as negative affective reaction to computers with concomitant behaviours and cognitions (Meier &

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