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Evaluation of the circumplex structure of the Activation Deactivation Adjective Check List before and after a short walk

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Abstract

Background and purpose: The Activation Deactivation Adjective Check List (AD ACL; Thayer, 1989, *The biopsychology of mood and arousal*. New York: Oxford University Press) has been used in several studies to assess affective responses to bouts of physical activity. In recent years, researchers have suggested that the structure of this multidimensional measure should approximate a circumplex. This hypothesis was examined using a circumplex-specific confirmatory method.

Methods: Volunteers ($n = 165$) completed the AD ACL before and after a short walk. The data were analyzed using Browne's Circumplex models for correlation matrices. (*Psychometrika, 57*, 469–497) circular stochastic process model and CIRCUM software and the analyses were performed at the item level.

Results and conclusions: Before the walk, the circumplex provided a close fit to the data, whereas, after the walk, the fit was lower, but still reasonable. At neither time did items theorized to belong to one subscale become interspersed with items theorized to belong to an adjacent subscale. The AD ACL represents a satisfactory, albeit imperfect, option for the assessment of affective responses to physical activity from a circumplex perspective. In the future, closer fit to circumplex structure should be achieved by taking the specific structural postulates of the circumplex model into account from the beginning of the scale development process.

Keywords: Activation Deactivation Adjective Check List; Activation; Valence; Affect; Circumplex

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Introduction

The Activation Deactivation Adjective Check List (AD ACL; Thayer, 1989) has been used in several studies examining affective responses to bouts of physical activity during the past 20 years (e.g. Bird, 1981; Ekkekakis, Hall, & Petruzzello, 1999; Ekkekakis, Hall, Van Landuyt, & Petruzzello, 2000; Hall, Ekkekakis, & Petruzzello, 2002; Jerome et al., 2002; Oweis & Spinks, 2001; Saklofske, Blomme, & Kelly, 1992; Tate & Petruzzello, 1995; Thayer, 1987a,b; Thayer, Peters, Takahashi, & Birkhead-Flight, 1993; Van Landuyt, Ekkekakis, Hall, & Petruzzello, 2000). Yet, as is the case with many of the self-report instruments used in this area of research, the structure of this multidimensional measure in the particular domain of physical activity has not been investigated. The necessity of such investigations was underscored recently, following suggestions from both general psychology (Feldman Barrett & Russell, 1999; Russell & Feldman Barrett, 1999; Schimmack & Reisenzein, 2002; Yik, Russell, & Feldman Barrett, 1999) and exercise psychology (Ekkekakis et al., 2000; Ekkekakis & Petruzzello, 2002; Hall et al., 2002; Van Landuyt et al., 2000) that the structure of the AD ACL should conform to the affect circumplex described by Russell (1978, 1980) and Tellegen and his associates (Tellegen, 1985; Watson & Tellegen, 1985; Zevon & Tellegen, 1982). On the basis of several considerations derived from an analysis of what was termed the 'affect measurement conundrum' in exercise psychology, Ekkekakis and Petruzzello (2002) proposed that the circumplex model could provide a useful conceptual and measurement framework for investigating affective responses to acute exercise. They further noted that the AD ACL, although not originally designed and validated as a measure of the circumplex dimensions, could be used in this role. Given the paucity of multi-item instruments specifically designed as measures of the circumplex dimensions in the literature, an empirical evaluation of the degree to which the structure of the AD ACL approximates a circumplex is important to investigators interested in assessing affective responses to exercise from a circumplex perspective. Thus, the purpose of the present study was to evaluate whether a circumplex provides an adequate fit to AD ACL data collected before and after a short bout of walking by taking advantage of a recently developed, circumplex-specific statistical modeling method (Browne, 1992) and software (Browne, 1995).

The evolution of the conceptual framework of the AD ACL

The AD ACL has been used in conjunction with a variety of conceptual frameworks since its inception. It is, therefore, important to review the history of the measure and explain how a measure that was initially intended to assess the levels of an 'activation continuum' came to be viewed as a potentially useful measure of the dimensions of the circumplex model of affect.

The AD ACL was initially developed as a measure of a bipolar activation continuum ranging from extreme excitement to deep sleep (Thayer, 1967). An item intercorrelation matrix containing 28 items considered to be indices of activation and 21 items considered to be 'nonactivation mood-descriptive' items, derived from Nowlis' (1965) mood measure, was factor-analyzed using the centroid method of extraction followed by a varimax rotation. Four of the 16 factors that emerged 'loaded mainly with activation adjectives' (Thayer, 1967, p. 665). These four factors were labeled 'General Activation' (*lively*, *active*, *full-of-pep*, *energetic*, *peppy*, *vigorous*, *activated*), 'High Activation' (*clutched-up*, *jittery*, *stirred-up*, *fearful*, *intense*), 'General Deactivation'