Self reported attentional control with the Attentional Control Scale: Factor structure and relationship with symptoms of anxiety and depression

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ABSTRACT

The Attentional Control Scale (ACS) is a self-report questionnaire that has been developed to measure individual differences in attentional control. Despite its fairly widespread use, little is known about the psychometric properties of the scale in adult samples. In the present study, factor structure of the ACS and its relationship with symptoms of anxiety and depression was investigated in a total sample of 728 Icelandic university students. Exploratory factor analysis in sample 1 ($n = 361$), yielded two factors, labeled focusing and shifting. Confirmatory factor analysis in sample 2 ($n = 367$) showed a reasonable fit of this two factor model. The two factors correlated strongly (0.73). The two subscales showed different predictive validity in a set of hierarchical regression analyses where the focusing subscale made a significant prediction of anxiety scores when depression scores were controlled for, and the shifting subscale significant prediction of depression scores when anxiety scores were controlled for. These findings are discussed in relation to previous studies on attentional and executive control in anxiety and depression.

1. Introduction

Neuroticism or trait anxiety is among the general vulnerability factors for the development of psychological disorders. The influence of such vulnerability factors on behavior is modulated by people's voluntary control efforts that is the ability to modulate or control dominant response tendencies in the service of another response (Rothbart & Bates, 1998). Voluntary control of attention, termed attentional control (Derryberry & Reed, 2001), may be particularly important given the existence of biased information processing at the level of attention and interpretation in anxiety (Cisler & Koster, 2010; Wells & Matthews, 1994) and depression (Joormann, 2009; Wisco, 2009). The Attentional Control Scale (ACS; Derryberry & Reed, 2002) is a self-report questionnaire that has been developed to measure individual differences in attentional control. Attention arises from several interacting networks, one being the anterior attentional system that serves an executive control function over other attentional processes (Posner & Rothbart, 1998). Because various functions of the anterior system have been proposed, the ACS was developed as a general scale to assess overall differences in voluntary attentional control (Derryberry & Reed,

2001). The scale has been used to study the role of voluntary control efforts in relation to various symptoms of psychopathology. However, despite its fairly widespread use, little is known about the psychometric properties of the ACS. The purpose of the present study was to investigate psychometric properties of the scale and its relationship to symptoms of anxiety and depression in adults.

The ACS comprises 20 items that initially appeared as two scales, attentional focusing and attentional shifting in a study by Derryberry and Rothbart (1988). They defined the construct of attentional focusing as "the capacity to intentionally hold the attentional focus on desired channels and thereby resist unintentional shifting to irrelevant or distracting channels" and attentional shifting as "the capacity to intentionally shift the attentional focus to desired channels, thereby avoiding unintentional focusing on particular channels" (Derryberry & Rothbart, 1988, p. 966). In recent years, the two scales have been combined under the heading of Attentional Control Scale using the total score as a measure of people's ability to control attention. According to Derryberry and Reed (2002), factor analyses of the ACS indicate that it consists of "...correlated sub factors related to the abilities (a) to focus attention (e.g., "My concentration is good even if there is music in the room around me"), (b) to shift attention between tasks (e.g., "It is easy for me to read or write while I'm also talking on the phone"), and (c) to flexibly control thought (e.g., "I can become interested in a new topic very quickly when I need to")" (Derryberry & Reed, 2002, p. 226). To the best of our knowledge, no studies have been

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published on the factor structure of the ACS in adult samples. Factor structure of the ACS has been evaluated in one study in a sample of eight to 18 year old Dutch children and adolescents (Verstraeten, Vasey, Claes, & Bijttebier, 2010). Results from confirmatory factor analysis in this study supported two factors rather than one with two items (items 9 and 10) being omitted from the analysis. The total score of the scale is internally consistent with reliability estimates ranging from $\alpha = 0.71$ (Gyurak & Ayduk, 2007; Verwoerd et al., 2006; cited in Verwoerd, de Jong, & Wessel, 2008) to $\alpha = .88$ (Derryberry & Reed, 2001, cited in Derryberry & Reed, 2002). Reliability estimates of the subscales have not been reported in adult samples, but in the study of Verstraeten et al. (2010) it was $\alpha = 0.70$ for the focusing scale and $\alpha = 0.63$ for the shifting scale with the scales being moderately correlated ($r = 0.41$). Similar results have been reported in other samples of children (Muris, de Jong, & Engelen, 2004).

Although little information is available on the psychometric properties of the ACS in adults, information on the validity of the ACS has been accumulating over the years. ACS has been used in a number laboratory experiments that focus on the interplay between effortful control and automatic processes in adults. Derryberry and Reed (2002) found that although participants high in self reported trait anxiety showed the often hypothesized automatic attentional bias towards threat stimuli in a computerized spatial orienting task (dot-probe task), anxious participants also scoring high on the ACS were better able to shift attention away from the threat at later intervals on the task, indicating that good attentional control allowed trait anxious participants to modulate the dominant attentional bias. Derryberry (2002) discusses three unpublished studies conducted in his laboratory that show that trait anxious participants scoring high on the ACS, compared with low ACS scorers, have better control over dominant response tendencies on a stimulus–response compatibility task, that impulsive participants scoring high on the ACS show better performance than low scorers on a stop-signal task and finally that high ACS scorers are better able to inhibit dominant conceptual associations on a priming task. Other investigators have also shown that attentional control, as indexed by the ACS, is linked with physiological reactions such as an eye-blink response to rejection in people that are sensitive to rejection because of low self-esteem (Gyurak & Ayduk, 2007). These results show that ACS scores are related to response control across different domains of behavior (orienting of attention, motor response tendencies, conceptual processing tendencies, physiological reactions) lending support for the notion that ACS taps the executive function of the anterior attentional system that is hypothesized to be involved in the top-down regulation of automatic responding (i.e., Posner & Raichle, 1994; Posner & Rothbart, 1998). This conclusion is further supported by results showing ACS scores to be correlated with activation of certain areas within the prefrontal cortex (rostral anterior cingulate) when fear related pictures are being processed (Mathews, Yiend, & Lawrence, 2004).

As would be expected, the total score of the ACS has moderate negative correlations with self-report measures of trait-anxiety (Derryberry & Reed, 2001, cited in Derryberry & Reed, 2002), neuroticism (Verwoerd et al., 2008) and depressive symptoms (Reinholdt-Dunne, Mogg, & Bradley, 2009). Verwoerd et al. (2008) also found that lower ACS scores predicted increase in diary ratings of intrusive thoughts over four consecutive days after watching an emotional film fragment, supporting the predictive validity of the scale. Support has also been found with self-report questionnaires for the hypothesized interaction between attentional control and predisposing factors when predicting symptoms of psychopathology. Ayduk et al. (2008) found for example in a non-clinical sample that better attentional control (measured with a 12 item abbreviated version of the ACS) attenuated the associa-

tion between rejection sensitivity and core symptom dimensions of borderline personality disorder among those high in rejection sensitivity.

The aim of the present study was to investigate the ACS and its relationship with symptoms of anxiety and depression using an Icelandic translation of the scale. Although the total score is generally used, the scale was originally composed of focusing and shifting subscales, and measures in addition the ability to flexibly control thoughts (Derryberry & Reed, 2002). Because no results on the factor structure of the ACS in adult samples have been published, we apply a split sample procedure in this study to explore the factor structure of the ACS in one sample and confirmatory factor analysis to test the fit of this factor structure in the second sample. We also wanted to investigate if the ACS sub-factors are differentially related to symptoms of anxiety and depression. Studies have shown that the ACS total score is negatively linked with trait anxiety, neuroticism and depressive symptoms (i.e., Ayduk et al., 2008; Derryberry & Reed, 2002; Reinholdt-Dunne et al., 2009) in adults but this relationship has not been investigated at the subscale level. Both focusing and shifting of attention as well as flexible control of thought are impaired in anxious and depressed moods (i.e., Elliott, 1998; Eysenck, Derakshan, Santos, & Calvo, 2007; Veiel, 1997), so corresponding sub-scales should all be related to measures of these symptoms. However, because measures of anxiety and depression are generally moderately correlated, the common variance needs to be taken into account to see if sub-factors of attentional control are uniquely related to anxiety and depression. For example, anxiety is characterized by high vigilance (Weierich, Treat, & Hollingworth, 2008; Wells & Matthews, 1994) that may be modulated by the ability to focus attention in face of distraction (i.e., Eysenck et al., 2007). Unique relationship between attentional shifting and depression would be consistent with considerable research evidence showing that depressed affect is related to a compromised shifting or switching abilities on executive control tasks (Channon, 1996; Davis & Nolen-Hoeksema, 2000; Grant, Thase, & Sweeney, 2001; Merriam, Thase, Haas, Keshavan, & Sweeney, 1999).

2. Methods

2.1. Participants

Three samples of undergraduate students enrolled in the Social Science Department of the University of Iceland were used in the present study. Two samples participated in a questionnaire study on attentional control and mindfulness and one sample in a questionnaire study on attentional control and thought suppression. Participants were approached during class hours and did not receive any compensation for their participation. The total sample consisted of 728 students, 234 males and 493 females (gender information for one case was missing). The mean age of the sample was 24.7 years (SD = 6.6, information concerning age for three cases was missing). The mean age and gender distribution were highly similar in all the three sub-samples.

2.2. Measures

2.2.1. Attentional Control Scale (ACS; Derryberry & Reed, 2002)

The psychometric properties of the ACS have been discussed in Section 1. The scale contains 20 items that are answered given four response choices (1 = almost never; 2 = sometimes; 3 = often; 4 = always) with higher scores indicating better attentional control. Eleven items have to be reversed before scoring. The ACS was translated into Icelandic by the first author, an independent back translation was created and final changes made to the Icelandic translation.