Anxiety and Cognitive Performance: A Test of Attentional Control Theory

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Declaration of Originality

This thesis is submitted to Bond University in fulfilment of the requirements of the degree of Doctor of Philosophy. This thesis represents my own original work towards this research degree and contains no material which has been previously submitted for a degree or diploma at this University or any other institution, except where due acknowledgement is made. All of the raw data and analyses have been retained and are available upon request. I certify that I have made and retained a copy of this document.

Elizabeth J. Edwards
30th April, 2015
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Publications

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Abstract

Attentional Control Theory (ACT) predicts that trait anxiety and situational stress interact to impair performance on tasks that involve the phonological loop and central executive, specifically the updating, inhibition and shifting functions. The theory suggests that anxious individuals recruit additional resources (e.g., effort, motivation) to prevent shortfalls in performance effectiveness (accuracy), with deficits becoming evident in processing efficiency (the relationship between accuracy and time taken to perform the task). These assumptions however, have not been systematically tested.

Two series of experimental studies investigated the relationship between anxiety and cognitive performance and were premised on ACT. Series 1 included four studies (Study 1.1, Study 1.2, Study 1.3, & Study 1.4) that examined the relationship between trait anxiety (somatic and cognitive; operationalised using questionnaire scores), situational stress (somatic and cognitive; manipulated using threat of electric shock and ego threat instructions, respectively), mental effort (indexed using a self-report visual analogue scale) and performance on phonological (forward and backward word span), updating (reading span), inhibitory (Go-No-Go), and shifting (WCST) tasks. Series 2 included three studies (Study 2.1, Study 2.2, & Study 2.3) that investigated the associations between cognitive trait anxiety (measured using questionnaire scores), situational stress (manipulated using ego threat instructions), motivation (indexed using questionnaire scores) and performance on an updating (reading span), inhibitory (Go-No-Go), and shifting (WCST) tasks. The two attentional tasks (inhibition and shifting) in Series 2 contained both neutral and threat-related stimuli (Study 2.2 & Study 2.3). The quasi-experimental designs examined the separate and combined
contributions of trait anxiety and situational stress in predicting performance effectiveness (quality of performance) and processing efficiency (ratio of effectiveness to RT), and investigated the moderating effects of mental effort (Series 1) and motivation (Series 2). For each experiment, the data were interpreted using separate hierarchical moderated regression analyses that allowed for the examination of the unique and combined contributions of the factors after controlling for depression, which is known to co-vary with anxiety.

The data suggested that somatic trait anxiety, somatic stress and effort did not combine to predict performance effectiveness or efficiency on phonological, updating, inhibitory or shifting tasks. Somatic trait anxiety and somatic stress did however combine to predict phonological efficiency on the complex task (backward word span), such that higher somatic trait anxiety predicted greater backward span efficiency at low stress relative to high stress (Study 1.1.1). This relationship was not moderated by mental effort. The findings were consistent with the notion that anxiety-performance link manifests in cognitive rather than somatic anxiety.

For phonological performance, the data revealed that cognitive trait anxiety, cognitive situational stress and effort interacted to predict phonological efficiency (but not effectiveness) on both the simple (forward word span) and complex (backward word span) task. When under evaluative stress conditions (ego threat) only, higher trait anxiety predicted lower efficiency at lower effort (Study 1.1.2).

In terms of updating performance, cognitive trait anxiety, situational stress and effort did not predict updating effectiveness or efficiency (Study 1.2.1 & Study 2.1.1) on the reading span task. With the inclusion of motivation as a
predictor however, the data revealed that cognitive trait anxiety and motivation combined to predict updating efficiency (but not effectiveness). At higher motivation, higher cognitive trait anxiety was related to better updating efficiency, whereas at lower motivation, higher cognitive trait anxiety was associated with poorer efficiency (Study 2.1.2).

With respect to inhibitory control, cognitive trait anxiety, cognitive stress and effort were inter-related with inhibitory effectiveness and efficiency. Irrespective of stress condition, higher trait anxiety was related with lower effectiveness at lower effort, yet higher trait anxiety was related to lower efficiency at higher effort (Study 1.3.2).

For shifting performance, the data showed that cognitive trait anxiety, situational stress and effort were inter-related with efficiency, but not effectiveness. At higher effort, higher trait anxiety was associated with poorer shifting efficiency independent of stress condition, whereas at lower effort, this relationship was highly significant and most pronounced for those in the ego threat group (Study 1.4).

In term of attentional biases in anxiety, the results demonstrated that situational stress and motivation combined to predict inhibitory efficiency (but not effectiveness) for threat-related relative to neutral words, such that higher motivation was related to poorer inhibitory efficiency for threat under high (ego threat), but not low (ego safe) situational stress (Study 2.2). Trait anxiety and situational stress combined to predict shifting effectiveness for threat words relative to neutral words, such that when under ego threat conditions, those lower in trait anxiety had better shifting effectiveness for threat versus neutral words, yet those higher in trait anxiety had poorer shifting effectiveness for threat.
Situational stress and motivation also combined to predict shifting effectiveness for threat-related relative to neutral words, such that lower trait anxiety was associated with better shifting effectiveness for threat at higher motivation. These patterns, however were not present in the data for shifting efficiency in the presence of threat (Study 2.3).

The overall patterns of results were interpreted with respect to ACT. Limitations of the current program of research are noted and directions for future work are suggested.
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