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In the heat of the moment: On the effect of state neuroticism on task performance

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ABSTRACT

The aim of this study was to further shed light on the relationship between neuroticism and performance by taking into account the situation-specific experience of neuroticism when undertaking cognitive tasks. A total of 121 high-performing professionals completed a state measure of neuroticism before solving a complex cognitive task. Indicators of trait neuroticism and fluid intelligence were also collected. Analyses revealed a curvilinear effect of state neuroticism on task performance suggesting that moderate levels of neuroticism experienced in a given situation are most effective for cognitive performance. This effect remained unchanged when controlled for trait neuroticism and fluid intelligence. Findings support the importance of better understanding experiential effects of personality on task performance.

1. Introduction

Research on the effect of personality on performance in cognitive tasks has typically been undertaken from a trait perspective. Within this perspective, personality dimensions are conceptualised in terms of structural differences between individuals that are assumed to remain stable across situations and that are related to behaviour, including performance on cognitive tasks (e.g., Ackerman & Heggestad, 1997; Austin, Deary, & Gibson, 1997; Austin et al., 2002; Reeve, Meyer, & Bonaccio, 2006). In this paper we make a distinction between personality as structure and personality as a state that is experienced in a given situation, and we argue for differences in the structural and experiential effects of personality. Specifically, we focus on one personality dimension, neuroticism, and investigate its effect on task performance, both from a trait and a state perspective.

2. Neuroticism and cognitive performance

Neuroticism is the Big Five personality dimension that is most closely linked to the experience of negative emotions. Individuals who score high on this dimension are more likely than low scorers to experience negative emotions such as anxiety, depression and anger. They also tend to evaluate themselves more critically (Costa & McCrae, 1992). Such characteristics could be expected to negatively influence performance on cognitive tasks. Indeed, empirical evidence suggests that trait neuroticism is negatively related to cognitive performance; however, the effect is small (Ackerman & Heggestad, 1997; Austin et al., 1997; Reeve et al., 2006). Ackerman and Heggestad (1997) report a meta-analytic correlation coefficient of −.15 between trait neuroticism and performance in cognitive ability tests.

We discuss two potential reasons for the relatively weak link that has been observed between neuroticism and performance: (1) Contrary to the more or less implicit assumption of linearity (Brand, Egan, & Deary, 1994) the neuroticism-performance link might, in fact, not be linear. (2) Trait neuroticism might not be as relevant as state neuroticism for performance on a given task to be performed in a given situation.

2.1. The non-linear neuroticism-performance effect

The argument that neuroticism might be related non-linearly to cognitive performance was proposed as early as in the 1960s (Eysenck & White, 1964; Lynn & Gordon, 1961). Using a student sample Lynn and Gordon (1961) observed a negative quadratic effect of trait neuroticism on performance in an intelligence test (Raven's Progressive Matrices). This effect has been explained in terms of drive theory and specifically the Yerkes–Dodson law (Hebb, 1955; Yerkes & Dodson, 1908).

The Yerkes–Dodson law states that (a) performance is an inverted U-function of arousal, such that as arousal increases performance first increases and then declines, and (b) the optimal level of arousal for performance is a function of task difficulty, such that easier tasks require higher levels of arousal than more difficult tasks. If trait neuroticism is identified with arousal or autonomic

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drive (Eysenck & White, 1964; Lynn & Gordon, 1961), and assuming that tasks in cognitive ability tests like the Raven's Progressive Matrices are of moderate difficulty to most individuals, it follows that both high and low levels of trait neuroticism are less effective than moderate levels of trait neuroticism in terms of performance on such tasks. Note however, that the Yerkes–Dodson law refers to within-person differences in the subjective experience of arousal when dealing with a cognitive task, which is arguably different from between-person structural differences in neuroticism as typically studied. Whereas differences in arousal can easily be manipulated, for example with varying doses of caffeine (Anderson, 1994), it is typically not expected that structural differences in neuroticism are similarly malleable (McCrae & Costa, 1999).

Possibly as a result of this conceptual issue of equating differences in the experience of arousal with structural differences in neuroticism, empirical evidence for a non-linear neuroticism-performance effect has been limited. Austin et al. (1997) observed a quadratic effect of trait neuroticism on cognitive performance, though, this effect was in the opposite direction with low and high neurotics (assessed using the NEO Five Factor inventory, Costa & McCrae, 1992) performing best on the Raven's Standard Progressive Matrices and a reading test. However, in a later study using a broader set of cognitive tasks, Austin et al. (2002) were unable to replicate this finding. Similarly, other authors found no evidence for a curvilinear relationship between trait neuroticism and cognitive performance (Reeve et al., 2006).

2.2. Trait neuroticism is too general

As argued, a possible reason for the difficulties authors have had in establishing a common understanding of the nature of the relationship between neuroticism and cognitive performance might be that they have typically analysed this relationship with a trait rather than state perspective. Traits, such as neuroticism, have been interpreted in terms of enduring neurobiological (Depue & Collins, 1999; Eysenck & Eysenck, 1985), genetically (pre-)determined (Jang et al., 2001), or complex psychological structures (McCrae & Costa, 1999), which are typically seen as unaffected by situational characteristics. For example, trait neuroticism has been identified with a neural system that relates to sensitivity to punishment (Gray, 1982) that predisposes individuals to higher levels of negative affect across threatening situations. In contrast, personality *states* characterise the momentary cognitive-affective experience of an individual and the related behavioural responses to specific situational cues. Thus, it is the personality state that signals the individual's current level of adaptation to the environment and is the proximal determinant of the individual's behavioural response. For this reason, the state experienced when undertaking a cognitive task might be a better predictor of performance than the related trait.

A state construct that has received much attention in the cognitive testing literature is test-anxiety. Test-anxiety can be interpreted as a state anxiety due to testing conditions (Hembree, 1988). Test-anxiety is related to neuroticism in that it taps into negative emotionality, and there is some evidence suggesting that trait neurotics are more likely to experience test anxiety (Dobson, 2000; Moutafi, Furnham, & Tsaousis, 2006). Correlations between test-anxiety and cognitive performance tend to be consistently stronger (meta-analytic $r = -.33$, Ackerman & Heggestad, 1997) than between trait neuroticism and cognitive performance (meta-analytic $r = -.15$).

The experience of a particular state will have causal properties that are distinct from the effects of the trait structure. There are at least two reasons why we assume this to be the case: (1) experiencing a particular state might signal information about the situation. For instance, negative affect might indicate urgency of the situation. This information cannot be inferred from the related, context-free, structural (i.e. trait) components of neuroticism, (2) experiencing a particular state can have an energising effect on behaviour. State anxiety, for example, has been associated with increases in on-task effort and initiation of processing activities (e.g., strategies) designed to improve performance (Eysenck & Calvo, 1992).

2.3. The current study

To our knowledge, there are few studies that have specifically looked at the effect of state neuroticism on cognitive performance, however there is indirect evidence that suggests that this effect might, in fact, be positive. For instance Beckmann, Wood, and Minbashian (2010) demonstrated that, when experiencing anxiety, frustration and stress – i.e., higher states of neuroticism – individuals tended to engage in more conscientious behaviours. To the extent that conscientiousness includes performance-facilitating behaviours, such as effort investment, efficiency, and systematicity, neurotic states might facilitate performance in cognitive tasks. Similarly, negative affect (a major aspect of the neurotic response) has been related to improved performance in tasks that require systematic, detail-oriented, bottom-up processing and the incorporation of new knowledge (Bless & Fiedler, 2006; Forgas, 2008).

We hypothesise that higher levels of state neuroticism will facilitate performance in a cognitive task, up to a certain level. We also expect very high levels of state neuroticism to be detrimental to task performance. In operational terms, we will test whether state neuroticism is curvilinearly related to performance in cognitive tasks, such that performance at low and high state neuroticism scores is lower than performance at moderate levels of state neuroticism.

To establish that a state perspective on neuroticism provides unique information not captured by the traditional trait perspective we will analyse whether the effect of state neuroticism occurs independently of individual differences in trait neuroticism.

One potential confound of the relationship between neuroticism and cognitive performance might be the level of cognitive ability. For instance, individuals who experience more difficulties in solving cognitive problems, in general, might also experience higher levels of state neuroticism (e.g., worry, frustration) when confronted with such tasks. For this reason, we will control for individual differences in fluid intelligence.

We recruited a sample of high-performing professionals who were undertaking a range of psychometric assessments as part of a training program run by a major university in Sydney, Australia. This context is conducive to studying the effects of neuroticism on task performance as it represents an assessment setting that is of relevance to examinees, and in that sense can claim more ecological validity than data commonly obtained from student samples.

3. Method

3.1. Participants

In total, 121 adults working in middle-level management roles (aged 24–52 years, $M = 34.2$, SD = 6.2, 42.1% female) at one of four large Australian companies (an insurance company, a major airline, a national broadcasting company, a financial institution) took part in the study. On average participants had 4.6 years of experience in management and had worked 2 years in their current role within the respective organisation. Of these, 70% had completed a university degree (29% postgraduate; 41% undergraduate); 13% of the participants reported "high school" as their highest level of education. The remaining 17% of participants reported having completed