The mediating effect of appraisal on the relationship between neuroticism and coping during an anagram-solving task: A goodness-of-fit hypothesis perspective

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Abstract

Using the goodness-of-fit hypothesis as a theoretical rationale, the current study examined whether stressor appraisals mediate the relationship between neuroticism and coping strategy use in the context of an anagram-solving task. One hundred and eight undergraduate students (65 female; 43 male) completed a neuroticism scale, attempted an anagram-solving task, and then completed brief measures of task appraisal and situational coping. In accordance with the goodness-of-fit hypothesis, appraised controllability was negatively correlated with both avoidance and emotion-focused coping; however the predicted positive correlation with task-focused coping was not obtained. Consistent with previous research, neuroticism was positively correlated with appraisals of how stressful the task was perceived to be and negatively associated with appraisals of task controllability. As predicted, neuroticism was positively associated with both emotion-focused and avoidance coping during the anagram-solving task. Moreover, the relationship between neuroticism and emotion-focused coping was fully mediated by appraised stress and appraised controllability, and the relationship between neuroticism and avoidance coping was fully mediated by appraised stress. These findings highlight the importance of measuring stressor appraisals when examining individual differences in situational coping and have implications for research on coping intervention.

Keywords: neuroticism, appraisal, coping, goodness-of-fit hypothesis, stress, control

1. Introduction

Neuroticism, a personality trait associated with an increased likelihood of experiencing negative emotions such as anxiety and depression (Costa & McCrae, 1992), has been consistently associated with both subjective reports of stress symptoms and the occurrence of stressful life events – even when these events are objectively defined (Ebstrup, Eplov, Pisinger, & Jorgensen, 2011; Magnus, Diener, Fujita, & Pavot, 1993). One potential explanation for this is that neuroticism is generally associated with a reliance on passive and maladaptive coping strategies (Vollrath & Torgersen, 2000). Coping can be defined as cognitive and behavioural efforts to manage demands that are appraised as taxing or exceeding the resources of the person (Lazarus & Folkman, 1984). Central to this definition is the notion of appraisal; essentially a situation can only be considered stressful if it is perceived to be stressful by the given individual. Additionally, from this perspective the coping process is conceptualised as being a dynamic interplay between the person and the stressful situation (O'Brien & DeLongis, 1996). Naturally, this has led to a substantial body of research exploring the role of personality traits in the coping process (Vollrath & Torgersen, 2000). Due to its association with both stress symptoms and stressful life-events, neuroticism has received particular attention in the research literature, and is the focus of the current study.

Neuroticism has consistently been linked with both appraisals of stressful situations and coping in the context of these situations. Specifically, individuals who score highly in neuroticism are reported to appraise ambiguous situations in a negative or threatening manner, and are therefore more likely to perceive threats where others do not (Costa & McCrae, 1987; Matthews & Campbell, 2010; Matthews et al., 2006; Schneider, 2004). This is consistent with a body of literature suggesting that trait anxiety (with which neuroticism is highly correlated) is associated with a negative interpretive bias in processing ambiguous information (MacLeod & Cohen, 1993). Research examining coping strategy use consistently reports that neuroticism is positively correlated with maladaptive emotion-focused and avoidant coping strategies

(Vollrath & Torgersen, 2000), such as disengagement, wishful-thinking, escape-avoidance, and emotional venting. Neuroticism is also negatively associated with more effective and direct coping strategies, often referred to as problem or task-focused coping (Bouchard, 2003; David & Suls, 1999; O'Brien & DeLongis, 1996; Penley & Tomaka, 2002; Vollrath & Torgersen, 2000). Importantly, recent findings suggest that these neuroticism-related differences in appraisal and coping can also be obtained in the context of laboratory and performance tasks in which participants all experience exactly the same objective stressor (e.g. vigilance, working memory, and anagram-solving tasks), thereby minimizing the likelihood that contextual differences account for the individual differences in appraisal and coping (Boyes & French, 2009, 2010; Matthews & Campbell, 2010; Matthews, et al., 2006; Shaw et al., 2010).

The goodness-of-fit hypothesis (Lazarus, 1993; Lazarus & Folkman, 1984) provides a potential rationale for the link between neuroticism and the use of generally passive and maladaptive coping strategies. The goodness-of-fit hypothesis emphasizes the importance of the match between an individual's coping efforts and characteristics of the specific stressful situation. Essentially it is argued that task-focused coping strategies should be used more frequently in controllable situations, where there are more opportunities to actually change the circumstances or have an impact on the stressful event. In contrast, avoidance and emotion-focused strategies should be more frequently used in less controllable situations, which by definition allow less change of the circumstances of the stressful situation (Lazarus, 1993; Lazarus & Folkman, 1984; Park, Armeli, & Tennen, 2004; Park, Folkman, & Bostrom, 2001; Park, Sacco, & Edmondson, 2011; Zeidner & Saklofske, 1996). From this perspective, it is possible that because individuals who score high in neuroticism tend to appraise stressful situations as being more threatening and less controllable, they therefore engage in more emotion-focused and avoidant coping and less task-focused coping.

The aim of the current study was to test empirically the hypothesis that stressor appraisals mediate relationships between neuroticism and coping strategy use. An anagram-

solving task, which has been employed previously to examine neuroticism-related differences in stressor appraisal and coping (Boyes & French, 2010), was used as a controlled laboratory-stressor. Laboratory-stressors minimize contextual confounds, thereby allowing individual differences in appraisal and coping to be measured (Boyes & French, 2009). However, accumulating evidence suggests that laboratory paradigms which employ unambiguously threatening stimuli (referred to as *strong situations*) are not optimal for examining individual differences, as they generally elicit uniform reactions (Lissek, Pine, & Grillon, 2006). Also, the cognitive bias literature has identified anxiety-linked biases specific to the processing of ambiguous information (MacLeod & Cohen, 1993). Therefore, in order to ensure maximum scope for individual differences in task appraisal, a mild-stress version of the anagram-solving task was used in the current study (see method section for a description of the task).

The following hypotheses were proposed. First, in accordance with the goodness-of-fit hypothesis (Lazarus & Folkman, 1984), appraised controllability of the task was predicted to be negatively correlated with avoidance and emotion-focused coping and positively correlated with task-focused coping. Second, neuroticism was hypothesized to be associated with negative appraisals of the anagram-solving task. Third, neuroticism was predicted to be positively associated with avoidance and emotion-focused coping and negatively associated with task-focused coping during the task. Finally, it was predicted that neuroticism-related differences in appraisal would mediate relationships between neuroticism and coping strategy use during the task.

2. Method

2.1. Participants

One hundred and eight undergraduate students (65 female; 43 male) took part in the study. Ages ranged between 18 and 30 years (M = 20.99, SD = 2.32). The gender ratio of the

sample reflected the gender breakdown of the undergraduate psychology population and first year students gained academic credit in exchange for participating in the study.

2.2. Measures

2.2.1. Anagrams: Tresselt and Mayzner (1966) provide normative solution times for a sample of 134 words and 378 associated anagrams. Participants attempted to solve six anagrams (with median solve times of 31s or less), were given as long as they required to solve the anagrams, were provided with pen-and-paper to assist them in the task, and could complete the anagrams in any order they wished. All anagrams had only a single correct solution and participants were shown the solutions after completing the task.

2.2.2. Neuroticism: A ten item neuroticism scale compiled from the International Personality Item Pool (Goldberg et al., 2006) was used. Items employed a five point response scale (*0: Very inaccurate; 4: Very accurate*). The scale has good internal consistency ($\alpha = .86$; Goldberg, et al., 2006) and correlates highly with other neuroticism measures ($r = .84$ with the NEO-FFI neuroticism subscale; Gow, Whiteman, Pattie, & Deary, 2005).

2.2.3. Appraisal: A five item scale was used to measure participants' appraisals of the anagram-solving task (Boyes & French, 2010). Three items assessed participants' stress appraisals (e.g. "How stressed did you feel during the anagram task?" $\alpha = .92$) and two items measured perceived control (e.g. "To what extent do you think that the task is manageable?" $\alpha = .78$). These items employed an 11 point response scale (*0: Not at all; 10: Extremely*).

2.2.4. Coping: The situational version of the Coping Inventory for Task Stressors (CITS-S; Matthews & Campbell, 1998) was used for post-task assessment of coping. It consists of task-focused (e.g. "I worked out a strategy for successful performance"), emotion-focused (e.g. "I became preoccupied with my problem"), and avoidance (e.g. "I stayed detached or distanced from the situation") coping subscales. Internal consistencies range between .84 and .86 (Matthews & Campbell, 1998). Each sub-scale contains seven items

usually responded to on a five point response scale (*0: Not at all; 4: Extremely*); however, in the current experiment the response scale was extended (*0: Not at all; 10: Extremely*, Boyes & French, 2009).

2.3. Procedure

The procedures for this study were approved by the Human Research Ethics Committee at the University of Western Australia. Participants completed the study individually and they were informed that the experiment aimed to assess relationships between personality and language ability. After giving consent participants completed the personality items then attempted the anagram-solving task. Immediately after the final anagram they completed the appraisal scale and the CITS-S. At the end of the session all participants were thoroughly debriefed as to the actual purpose of the study.

3. Results

Total neuroticism, appraised stress, and control appraisal, task-focused, emotion-focused, and avoidance coping scores, as well as the mean number of anagrams solved correctly are summarised in Table 1. Consistent with previous research (Hankin & Abramson, 2001), a significant gender difference in neuroticism was obtained [$F(1, 104) = 4.16$, $p = .044$] with females ($M = 19.83$, $SD = 7.13$) scoring significantly higher than males ($M = 16.90$, $SD = 7.35$). Therefore, gender was controlled for in all statistical analyses. Neuroticism scores were uncorrelated with performance (number of anagrams solved correctly) during the anagram-solving task ($r = .02$, $p = .80$). Additionally, analysis using groupings based on a median split confirmed that there were no differences in the number of correctly solved anagrams between participants who scored low ($M = 5.58$, $SD = 1.03$) and high ($M = 5.70$, $SD = .59$) in neuroticism; $F(1, 100) = .50$, $p = .481$.

(Insert Table 1 approximately here)

3.1. Correlational Analyses

Partial correlations (controlling for gender) between neuroticism, appraised stress, appraised controllability, and coping strategy are summarised in Table 2. Consistent with the goodness-of-fit hypothesis, appraised controllability was negatively correlated with both emotion-focused and avoidance coping; however, the predicted correlation between appraised controllability and task-focused coping was not statistically significant. As expected, neuroticism was positively correlated with how stressful the task was perceived to be and negatively correlated with appraised controllability. Additionally, neuroticism was also significantly correlated with emotion-focused and avoidance coping, permitting a test of the final hypothesis, that the relationships between neuroticism and both avoidance and emotion-focused coping are mediated through appraised controllability and appraised stress.

(Insert Table 2 approximately here)

3.2. Mediational Analyses

Tests of multiple mediation (i.e. appraised stress and appraised controllability) of the relationships between neuroticism and emotion-focused and avoidance coping were conducted using the methodology (and SPSS macro) developed by Preacher and Hayes (2008).

3.2.1. Emotion-focused coping: Neuroticism was entered as the predictor variable and appraised stress and appraised control were entered as mediating variables. Gender was entered as a covariate. The final model accounted for 56% of the variance in emotion-focused coping; $R^2 = .56$, $F(4, 99) = 32.12$, $p < .001$. As neuroticism was not a significant predictor of emotion-focused coping in this model (Table 3), together appraised stress and controllability fully mediated the relationship between neuroticism and emotion-focused coping. Appraised stress and appraised controllability remained significant predictors of emotion-focused coping in the regression model. The total indirect effect of neuroticism on emotion-focused coping, as well as the indirect effects via both appraised stress and appraised controllability are summarised in

Table 4 (with bias corrected 95% confidence intervals based on 1000 bootstrap samples). Sobel tests confirmed that both appraised stress and appraised controllability were significant mediators of the relationship between neuroticism and emotion-focused coping (Table 4).

(Insert Table 3 and Table 4 approximately here)

3.2.2. Avoidance coping: Again, neuroticism was entered as the predictor variable and appraised stress and appraised control were entered as mediating variables. Gender was again entered as a covariate. The final model accounted for 16% of the variance in avoidance coping; $R^2 = .16$, $F(4, 100) = 4.67$, $p = .002$. As neuroticism was not a significant predictor of avoidance coping in this model (Table 5), together appraised stress and controllability fully mediated the relationship between neuroticism and avoidance coping. However, only appraised stress remained a significant predictor of avoidance coping in the regression model. The total indirect effect of neuroticism on avoidance coping, as well as the indirect effects via both appraised stress and appraised controllability are summarised in Table 6 (with bias corrected 95% confidence intervals based on 1000 bootstrap samples). Sobel tests confirmed that appraised stress (but not appraised controllability) was a significant mediator of the relationship between neuroticism and avoidance coping (Table 6).

(Insert Table 5 and Table 6 approximately here)

4. Discussion

The aim of the current study was to determine whether stressor appraisals mediate the relationships between neuroticism and coping strategy use in the context of an anagram-solving task. As predicted, neuroticism was associated with both negative appraisals of the anagram-solving task as well as coping strategy use during the task. With regard to appraisal, neuroticism was positively correlated with how stressful the task was perceived to be and negatively correlated with appraised controllability of the task. In relation to coping,

neuroticism was positively correlated with both avoidance and emotion-focused coping and the predicted negative correlation between neuroticism and task-focused coping was approaching significance (p = .063). Overall, these findings are consistent with a substantial literature linking neuroticism with both negative stressor appraisals (Ebstrup, et al., 2011; Magnus, et al., 1993; Schneider, 2004), a reliance on passive and maladaptive coping strategies in general (Vollrath & Torgersen, 2000), as well as emotion-focused and avoidance coping in the context of laboratory stressors and performance tasks (Boyes & French, 2009, 2010; Matthews & Campbell, 2010; Matthews, et al., 2006; Shaw, et al., 2010). However, it should be noted that these neuroticism-related differences in appraisal and coping were not associated with task performance (i.e. number of anagrams solved correctly). The compensatory control model of Hockey (1997) suggests that an important aspect of task performance involves monitoring and self-regulating effort. Although no neuroticism-related differences in overall performance were obtained, it may be the case that because individuals who score high on neuroticism appraise the task to be more stressful they engage in more compensatory effort (Eysenck, Derakshan, Santos, & Calvo, 2007; Hockey, 1997). A limitation of this study was that anagram solve time were not collected. Recording solve times in future studies may shed light on whether neuroticism is associated with compensatory effort in the anagram-solving task. Specifically, if this is the case, it would be hypothesized that individuals high in neuroticism would take longer to solve the anagrams (Hockey, 1997).

Overall, findings provided partial support for the goodness-of-fit hypothesis (Lazarus & Folkman, 1984; Park, et al., 2004; Park, et al., 2011). As predicted, appraised controllability was negatively correlated with both avoidance and emotion-focused coping but the predicted positive correlation between appraised controllability and task-focused coping was not significant. However, the current study extends the research literature by providing preliminary evidence that relationships between neuroticism and coping are mediated through neuroticism-related differences in stressor appraisal. Specifically, appraised controllability and appraised

stress fully mediated the relationship between neuroticism and emotion-focused coping and stress appraisal fully mediated the relationship between neuroticism and avoidance coping. These findings are theoretically consistent with goodness-of-fit hypothesis and offer a potential mechanism accounting for the widely reported relationships between neuroticism and passive and maladaptive forms of coping (Vollrath & Torgersen, 2000). However, the fact that control appraisal did not mediate the relationship between neuroticism and avoidance coping was unexpected. Given that almost all participants solved all six anagrams correctly, it may be the case that the task demands were insufficient to elicit task disengagement. Matthews and Cambell (2010) have recently demonstrated that time pressure is associated with decreased effort and task engagement using a rapid information task configured to overload attention. Importantly, much of the variance in responses was attributed to individual differences in appraisal and coping (Matthews & Campbell, 2010). Further research examining relationships between neuroticism, appraisal, and coping using stressors in which the task demands can be experimentally manipulated will be useful in unpacking how task demands (and specifically individual differences in how these demands are appraised) are associated with situational coping, task engagement, and performance.

Two additional limitations of the current study should be noted. First, generalising findings from laboratory studies to the real world can be problematic (Tajfel, 1972). The way in which individuals cope with mild laboratory stressors might be very different to how they cope with events with real life implications. Future research examining the relationships between neuroticism, appraisal, and coping using specific real world stressors is clearly required. To minimise contextual confounds, and to allow clearer conclusions regarding neuroticism-related differences to be made, appraisal and coping should be measured in individuals who are experiencing the same real life stressor (Boyes & French, 2011; Connor-Smith & Flachsbart, 2007). Second, the appraisal measure used in the current study is not well-known in the coping literature (although the reliability estimates were adequate to good).

Future research should examine relationships between neuroticism, appraisal, and coping using additional theorised dimensions of appraisal (e.g. primary/secondary appraisal and threat/challenge appraisals; Ferguson, Matthews, & Cox, 1999; Lazarus & Folkman, 1984; Matthews, et al., 2006).

Bearing these limitations in mind, the current study offers preliminary evidence that relationships between neuroticism and both avoidance and emotion-focused coping are mediated through stressor appraisal, and offers a useful framework for interpreting the literature on neuroticism, stressor appraisal, and coping behaviour. Findings demonstrate the significance of stressor appraisals in determining coping strategy use and highlight the importance of measuring appraisal when researching individual differences in coping behaviour – understanding individual differences in coping strategy use is likely to require an understanding of both objective stressor characteristics and individual perceptions of stressful situations. Future research might examine whether relationships between neuroticism and negative stressor appraisals are a higher-level manifestation of an underlying interpretive bias in information processing (which is routinely measured in basic cognitive paradigms; MacLeod & Cohen, 1993). Results also have implications for research in coping intervention. The finding that coping is mediated through stressor appraisal suggests that intervention efforts need to target stressor appraisal as well as coping behaviour. Research evaluating coping intervention programmes should examine the impact of changing stressor appraisals on both coping behaviour and traditionally measured mental health outcomes. However, it should be noted that linking cognitive processes (such as appraisal) and behaviours (e.g. coping strategies) necessitates conceptualising on a variety of levels. The Self-Regulatory Executive Function Framework (S-REF) model of emotional disorders attempts to integrate automatic processing, voluntary processing, and generic self-beliefs as influences of emotional distress, symptoms of clinical affective disorder, and stress reactions (Wells & Matthews, 1994, 1996). The S-REF model may be a useful framework for integrating research examining neuroticism-

related differences in stressor appraisal and coping into the broader cognition and emotion literature

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Table 1. Mean neuroticism, appraisal, and coping scores, and number of anagrams solved correctly (with standard deviations)

	Mean	Standard Deviation
N	28.75	7.36
App (Stress)	11.89	7.68
App (Control)	15.05	3.64
TF Coping	46.11	9.68
EF Coping	21.89	15.48
Avoidance	25.63	8.57
Anagrams solved	5.63	.85

Note: N = neuroticism, App (Stress) = appraised stress, App (Control) = appraised controllability, TF Coping = task-focused coping, EF Coping = emotion-focused coping, Avoidance = avoidance coping

Table 2. Partial correlations (controlling for gender) between neuroticism, appraisal, and coping scores

	1) N	2) App (Stress)	3) App (Control)	4) TF Coping	5) EF Coping	6) Avoidance
1	-	.36***	-.30**	-.19	.40***	.22*
2		-	-.63***	.14	-.63***	-.27**
3			-	-.02	.69***	.38***
4				-	-.08	-.29**
5					-	.55***
6						-

Note: * p < .05, ** p < .01, *** p < .001; N = neuroticism, App (Stress) = appraised stress, App (Control) = appraised controllability, TF Coping = task-focused coping, EF Coping = emotion-focused coping, Avoidance = avoidance coping

Table 3. Summary of model examining appraised stress and controllability as mediators of the relationship between neuroticism and emotion-focused coping

	B	Standard Error	*t*	*p*	95% Confidence Interval of *B*
Constant	23.40	8.40	2.78	**.002**	6.73 - 40.06
Gender	-1.29	2.12	-.61	.545	-5.51 - 2.93
N	.29	.15	1.89	.061	-.01 - .59
App (Stress)	.90	.18	5.06	**< .001**	.55 - 1.26
App (Control)	-1.34	.37	-3.63	**< .001**	-2.06 - -.61

Note: Outcome variable is emotion-focused coping; N = neuroticism, App (Stress) = appraised stress, App (Control) = appraised controllability; significant *p* values are bolded

Table 4. Summary indirect effects of neuroticism on emotion-focused coping (and associated Sobel tests)

	Effect	Standard Error (Bootstrap)	95% Confidence Interval of Effect (Bootstrap)	Sobel test *z*	Sobel test *p*
Total indirect effect	.51	.14	.23 - .80	--	--
App (Stress)	.33	.12	.11 - .59	2.93	**.003**
Appr (Control)	.19	.08	.06 - .43	2.23	**.025**

Note: Outcome variable is emotion-focused coping; N = neuroticism, App (Stress) = appraised stress, App (Control) = appraised controllability; significant *p* values are bolded

Table 5. Summary of model examining appraised stress and controllability as mediators of the relationship between neuroticism and avoidance coping

	B	Standard Error	*t*	*p*	95% Confidence Interval of *B*
Constant	20.09	6.38	3.15	**.002**	7.44 - 32.74
Gender	1.02	1.62	.63	.531	-2.20 - 4.24
N	.09	.12	.74	.461	-.14 - .32
App (Stress)	.37	.14	2.72	**.001**	.10 - .64
App (Control)	-.12	.28	-.42	.672	-.67 - .44

Note: Outcome variable is avoidance coping; N = neuroticism, App (Stress) = appraised stress, App (Control) = appraised controllability; significant *p* values are bolded

Table 6. Summary indirect effects of neuroticism on avoidance coping (and associated Sobel tests)

	Effect	Standard Error (Bootstrap)	95% Confidence Interval of Effect (Bootstrap)	Sobel test *z*	Sobel test *p*
Total indirect effect	.15	.06	.04 - .28	--	--
App (Stress)	.13	.06	.03 - .28	2.14	**.032**
App (Control)	.02	.05	-.07 - .12	.40	.691

Note: Outcome variable is emotion-focused coping; N = neuroticism, App (Stress) = appraised stress, App (Control) = appraised controllability; significant *p* values are bolded