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Clarifying the relation between neuroticism and positive emotions

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ABSTRACT

Little focus has been placed on clarifying the relation between neuroticism and positive emotions, even as numerous studies have consistently documented that neuroticism is more strongly related to negative than positive emotions while the converse holds true for extraversion. The present results show that the strength and direction of the neuroticism–positive emotion association depend on circumstances, and the relation is not necessarily always weak and non-significant. Neuroticism was inversely associated with positive emotions in an unpleasant situation, although it showed no relation with positive emotions in a pleasant situation. This suggests that high-neuroticism individuals are capable of feeling as much positive emotions as low-neuroticism individuals under certain, but not all, circumstances. This research has implications for how high-neuroticism individuals' well-being can be enhanced via increasing their positive emotions instead of focusing on decreasing their negative emotions.

1. Introduction

There is a myriad of studies documenting the links between personality traits and affect. Correlational, experimental, and longitudinal studies have found that neuroticism is positively associated with negative affect, and extraversion is positively associated with positive affect (e.g., DeNeve & Cooper, 1998; Tellegen, 1985; Watson & Clark, 1992). Consistently, these studies demonstrate that neuroticism and extraversion are not only respectively linked to transient negative and positive emotions, current negative and positive affect, but also predict future negative and positive affect (Costa & McCrae, 1980). On the other hand, both correlational (e.g., Costa & McCrae, 1980) and experimental (Larsen & Ketelaar, 1989, 1991; Rusting & Larsen, 1997) studies have found barely any correlation between neuroticism and positive emotions.

The underlying biological mechanisms between traits and emotions can explain why neuroticism is strongly related to negative emotions but only weakly related to positive emotions, whereas the converse is true for extraversion. Recent studies suggest that there are neural and physiological mechanisms for the relations between neuroticism and negative emotions, and between extraversion and positive emotions (Canli et al., 2001; Gomez, Gomez, & Cooper, 2002; Rusting & Larsen, 1997). Heritability studies, which found that genetics account for a large percentage of the variance in positive and negative affect (Lykken & Tellegen, 1996; Tellegen et al., 1988), provided further support for this biological perspective. Lykken and Tellegen estimated the heritability of positive and negative affect to be as high as 80% based on retest correlations of monozygotic and dizygotic twins after ten years. Similarly, there is evidence indicating that about 31% of the variance in neuroticism and 41% in extraversion could be attributed to shared genes (Pedersen, Plomin, McClearn, & Friberg, 1988).

The temperamental differences in negative and positive affect can be explained by differences in reactivity and tonic affect. Differences in reactivity to emotional stimuli arise from temperamental differences in neuroticism and extraversion. Individuals high in neuroticism react more strongly to negative stimuli than those low in neuroticism, and individuals high in extraversion react more strongly to positive stimuli than introverts (Gross, Sutton, & Ketelaar, 1998; Larsen & Ketelaar, 1989, 1991). Experimental studies found that neuroticism showed a positive association with negative emotions when individuals imagined an unpleasant situation, whereas extraversion was positively related to positive emotions in an imaginary pleasant situation (Larsen & Ketelaar, 1989, 1991). Besides differences in reactivity to emotional stimuli, individual differences in emotions could also be due to differences in baseline affect. The affect-level model advocates that there are neuroticism differences in tonic levels of negative affect, so individuals high in neuroticism would feel more negative in all circumstances or with all stimuli, and likewise for extraversion (Gross et al., 1998; Lucas & Baird, 2004). Indeed, Lucas and Baird found that individuals high in extraversion felt stronger positive affect than introverts not only in positive, but also neutral mood inductions. Both models were corroborated by findings by Gross et al., which showed that neuroticism was correlated with higher baseline negative affect, and with increases in negative emotions in response to unpleasant stimuli, whereas extraversion was correlated with higher baseline positive affect, and with increases in positive emotions in response to pleasant stimuli.

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The lack of an association between neuroticism and positive emotions does not indicate that they are completely unrelated under all circumstances. Though often non-significant, the negative correlations between neuroticism and positive emotions (e.g., DeNeve & Cooper, 1998; Diener & Emmons, 1985) suggest that they are not completely independent under all circumstances and that there is a need for further clarification. Furthermore, there is evidence that neuroticism is negatively related to positive emotional information processing (positive judgment and interpretation; Rafienia, Azadfallah, Fathi-Ashtiani, & Rasoulzadeh-Tabatabaiei, 2008), implying that neuroticism may thus also be related to positive emotions. It is possible that neuroticism may be associated with positive emotions in response to pleasant but not neutral or unpleasant stimuli (or vice versa), or only for certain types of positive emotions. The present study is one of the few experimental studies (e.g., Larsen & Ketelaar, 1991; Rusting & Larsen, 1997) to investigate whether neuroticism is related to positive emotions. It aims to clarify whether neuroticism may be related to positive emotions contingent on the type of situation, for example, a pleasant versus an unpleasant situation.

Unlike previous studies which usually used very unpleasant stimuli or mood inductions to elicit strong negative emotions and minimal positive emotions, and very pleasant stimuli or mood inductions to elicit strong positive emotions and minimal negative emotions, the present study adopted a different design. The same laboratory situation was used to concurrently elicit both positive and negative emotions of mild to moderate intensities. It is possible for people to experience both positive and negative emotions in response to the same event, albeit only at low-to-moderate intensities. Positive and negative affect are not bipolar; some situations, whether they are dramatic life events or simple tasks, can simultaneously elicit mixed emotions of both positive and negative affect, although most people typically feel either happy or sad, and not both simultaneously (Larsen, McGraw, & Cacioppo, 2001; Larsen, McGraw, Mellers, & Cacioppo, 2004).

In this study, participants completed an anagram task of moderate difficulty and were randomly assigned to receive either pleasant or unpleasant feedback. The anagram task was designed such that most participants could successfully complete some but not all the items, thus participants could either feel positive or negative about it, depending on individual differences. When coupled with unpleasant feedback, most people should experience moderate negative emotions and slight positive emotions. Conversely, with pleasant feedback, they should feel moderate positive emotions and slight negative emotions. Therefore, a merit of this experimental design is that it enabled one to examine both positive and negative emotions concurrently, unlike most previous studies which focused on either type, but not both concurrently.

2. Method

One hundred and thirty-three University of Illinois psychology undergraduates participated in this study for partial course credit. They worked on a cognitive task, which consisted of ten anagrams (six difficult and four easy), and had 60 s to solve each anagram. The difficult anagrams consisted of simple seven-letter words (e.g., "dubious" and "circuit"), but scrambled such that it would be very difficult to solve them within the time limit. The easy anagrams comprised four-letter words (e.g., "desk" and "loft") that were very easy to solve. Based on pilot studies and a previous study (Ng & Diener, in press), it was found that on average, participants could solve only one to two seven-letter anagrams out of ten when given less than a minute for each, whereas those given 10 four-letter anagrams could solve seven to eight. To present a moderately difficult, yet manageable task that could elicit both negative and positive emotions, six difficult and four easy anagrams were selected.

Before starting the task, participants were informed that the aim of the study was to examine how college students perform on a variety of cognitive tasks. The instructions also stated that the anagram task served as a test of verbal ability, and that data from over three hundred University of Illinois (UI) students had been collected. After the task, participants were randomly assigned to receive either pleasant feedback ($n = 67$) or unpleasant feedback ($n = 66$). The pleasant feedback stated that the participant had performed quite well and his performance was better than the average UI student. Conversely, the unpleasant feedback stated that the participant had performed quite poorly and his performance was worse than the average UI student.

After receiving the feedback, participants indicated on a 7-point scale (1 = *not at all*; 4 = *somewhat*; 7 = *very strongly*) the extent to which they currently experienced negative and positive emotions. Ratings for the four negative emotions (anxiety, disappointment, frustration, sadness) were combined to provide a composite negative emotion score ($\alpha = .81$), and ratings for the four positive emotions (happiness, relief, satisfaction, pride) were combined to provide a composite positive emotion score ($\alpha = .81$). After completing the emotion ratings, participants proceeded to other unrelated tasks for a different study. At the end of the session, a neuroticism scale that was based on the Big Five, and consisting of twenty items (International Personality Item Pool, IPIP; Goldberg et al., 2006), was administered. The reliability of the neuroticism score ($\alpha = .91$) was good. Participants also reported how much positive affect, PA (happiness, contentment, caring, pride, enthusiasm) and negative affect, NA (anxiety, worry, anger, guilt, sadness, unhappiness) they generally experienced on average. Reliabilities of the PA ($\alpha = .82$) and NA ($\alpha = .82$) scores were also adequate.

3. Results

Preliminary analyses indicated that neuroticism was related to higher general NA and negative emotions. Conversely, it was related to lower general PA, but showed no relation with positive emotions (see Table 1 for correlations). Table 1 also reports the correlations for each feedback condition separately.

To understand the relations between neuroticism and each type of emotion, separate regressions comprising feedback, mean-centered neuroticism, and their interaction were conducted for positive and negative emotions. For both analyses, the main effect of feedback was significant, confirming that the feedback manipulation worked as intended. Those who received unpleasant feedback experienced more negative emotions ($M = 3.10$, $SD = 1.02$) than those who received pleasant feedback ($M = 2.35$, $SD = 1.02$), $t(129) = -4.21$, $p < .001$. Conversely, those who received pleasant feedback experienced more positive emotions ($M = 3.39$, $SD = 1.14$) than those who received unpleasant feedback ($M = 2.86$, $SD = 1.12$), $t(129) = 2.69$, $p = .008$. The analysis for nega-

Table 1
Correlations between neuroticism, momentary emotions, and general affect.

	Neuroticism		
	Overall	Pleasant feedback	Unpleasant feedback
Negative emotions	.27[a]	.30[*]	.31[*]
Positive emotions	−.10	.04	−.30[*]
Negative affect	.61[b]	.66[b]	.53[b]
Positive affect	−.36[b]	−.34[a]	−.40[b]

[*] $p < .05$.
[a] $p < .01$.
[b] $p < .001$.