



## Full Length Article

# Three-way interaction of neuroticism, extraversion, and conscientiousness in the internalizing disorders: Evidence of disorder specificity in a psychiatric sample<sup>☆</sup>



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## ABSTRACT

It is well-established that neuroticism, extraversion, and conscientiousness are individually associated with internalizing disorders, but research suggests that these main effects may be qualified by a three-way interaction when predicting depression. The current study was the first to examine this three-way interaction in a psychiatric sample ( $N = 463$ ) with a range of internalizing symptoms as the outcomes. Using two omnibus personality inventories and a diagnostic interview, the expected three-way interaction emerged most consistently for symptoms of major depression, and there was also evidence of synergistic effects for post-traumatic stress disorder and generalized anxiety disorder. Findings indicate that, even in a clinically-distressed and currently-disordered sample, high levels of extraversion and conscientiousness protect against distress disorders for those with high levels of neuroticism.

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## 1. Introduction

A large body of research has established that personality traits are associated with internalizing psychopathology (i.e., mood and anxiety disorders/symptoms), both concurrently and longitudinally (e.g., Jeronimus, Kotov, Riese, & Ormel, 2016; Klein, Kotov, & Bufferd, 2011; see Kotov, Gamez, Schmidt, & Watson, 2010 for a meta-analysis of concurrent associations; Naragon-Gainey, Gallagher, & Brown, 2013; Watson & Naragon-Gainey, 2014). Specifically, neuroticism—which may be defined as a tendency to experience negative emotions and high stress reactivity—is a particularly strong predictor of depression and anxiety, along with related traits such as negative affectivity and the behavioral inhibition system (e.g., Kotov et al., 2010; Watson & Naragon-Gainey, 2014). Extraversion, or the tendency towards sociability, assertiveness, venturesomeness, and the experience of positive emotions (related constructs include positive affectivity and the behavioral

activation system), is more moderately and inversely associated with these disorders. Furthermore, associations with extraversion show greater disorder specificity, with some evidence of stronger links to depression and social anxiety in particular (Brown, Chorpita, & Barlow, 1998; Kotov et al., 2010; Watson, Gamez, & Simms, 2005; Watson & Naragon-Gainey, 2014). Finally, conscientiousness (i.e., a tendency to be planful, organized, goal-oriented, and non-impulsive; similar to effortful control) is moderately inversely associated with all internalizing disorders (Kotov et al., 2010).

Most existing research has focused on the main effects of these traits on internalizing psychopathology, whether singly or additively. But theory suggests that there may be synergistic relationships among them that are particularly relevant to depression, such that their interactions should be considered (e.g., Dinovo & Vasey, 2011; Klein et al., 2011). For example, generally someone with high levels of neuroticism is at increased risk for depression, but if s/he is also very sociable and often experiences positive emotions such as enthusiasm and excitement (that is, high levels of extraversion), these protective experiences would greatly reduce or eliminate the risk conferred by his/her high neuroticism. In contrast, levels of neuroticism would be much more predictive of depression symptoms for an individual who is isolated and has

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fewer sources of pleasure (that is, low levels of extraversion). Similarly, high conscientiousness is associated with planful action and successful realization of goals, which may be critical to help an individual with high neuroticism and/or low extraversion mobilize themselves to overcome tendencies towards sadness, withdrawal, and inactivity and to contact rewarding stimuli, thereby reducing or eliminating depression risk. However, for those with low conscientiousness, high neuroticism and/or low extraversion would remain predictive of greater depression.

A number of studies have examined interactions between each pair of these traits and related constructs, generally (though not always) yielding significant interaction terms when predicting depression (e.g., Gershuny & Sher, 1998; Joiner & Lonigan, 2000; Verstraeten, Vasey, Raes, & Bijttebier, 2009). However, recent empirical work by Vasey and colleagues indicates that there is a significant three-way interaction<sup>1</sup> that qualifies the two-way interactions, which may account for some of the null findings regarding two-way interaction. Specifically, in five of six samples with a cross-sectional design and in one prospective, longitudinal study, the positive association between neuroticism-related traits and depression was weakened only in the presence of high levels of extraversion-related traits and high levels of conscientiousness-related traits (Dinovo & Vasey, 2011; Vasey et al., 2013, 2014). More generally, “low-risk” levels of any two traits (i.e., low neuroticism, high extraversion, high conscientiousness) reduced or eliminated the negative impact of “high-risk” levels of the third (i.e., high neuroticism, low extraversion, or low conscientiousness). There was also evidence for the reverse manifestation of the three-way interaction, though the magnitude of this effect was weaker and more limited in the range at which it was observed. In this pattern, individuals with high neuroticism-related traits and low extraversion-related traits showed a weakened protective effect of high conscientiousness-related traits (with similar results for other combinations of two high-risk trait levels and one low-risk trait level).

In their series of three studies, Vasey and colleagues replicated the significant three-way interaction across different ages (children through young adults) and different self-report measures. Furthermore, they found evidence that the effect may be specific to depression, as the three-way interaction was not a significant predictor of general anxiety (i.e., a combination of different anxiety disorder symptoms; Vasey et al., 2013) or symptoms common to depression and anxiety (i.e., general distress; Dinovo & Vasey, 2011; Vasey et al., 2014). These robust results suggest that it is important to consider all three traits in concert and synergistically for a complete understanding of how they are associated with depression.

Although these studies are promising, they are few in number and leave open several important questions that the current study seeks to address. First, a three-way interaction has not yet been tested in a psychiatric sample, which would have more extreme mean levels of high-risk traits and symptoms than unselected samples. As such, it is not clear whether interactive effects among the traits are applicable only at average trait levels and minimal/mild psychological symptoms, or if they generalize to those with significant psychopathology. It is plausible, for example, that in a sample with more extreme high-risk trait levels, the protective effects of high extraversion and high conscientiousness may be insufficient (or high levels on these traits may occur too rarely) to reduce the strong risk associated with very high neuroticism. As there is some evidence of significant two-way interactions in clinical samples (e.g., Joiner & Lonigan, 2000), we hypothesize that the three-way interaction predicting depression will be present in the current

study's clinical sample, though it may be weaker or require higher levels of extraversion and conscientiousness for the protective effect to emerge in comparison to non-clinical samples.

In addition, there has not yet been a thorough examination of the three-way interaction in the anxiety disorders or other related disorders, as prior studies used a single anxiety outcome that collapsed across heterogeneous symptoms, potentially obscuring effects that may vary across disorders (Dinovo & Vasey, 2011; Vasey et al., 2013, 2014). Thus, in the current study, we examine a range of anxiety disorders (i.e., social anxiety, panic, agoraphobia, generalized anxiety disorder [GAD]) as well as other disorders that are associated with anxiety and depression (i.e., posttraumatic stress disorder [PTSD], obsessive-compulsive disorder [OCD]).

There are several reasons to expect that the three-way interaction may predict at least some anxiety disorders, including the fact that depression is highly comorbid with many of these disorders (e.g., Watson & Naragon-Gainey, 2014; Watson et al., 2005). Conceptually, the general rationale for the protective effect of high conscientiousness against depression risk seems equally applicable to anxiety disorders. That is, greater effortful control may mitigate the harmful tendencies of expressions of high levels of negative affect that are linked to anxiety (i.e., avoidance, cognitive perseveration), suggestive of a neuroticism X conscientiousness interaction (see Lonigan & Phillips, 2001). However, the main effect of extraversion is more selectively related to anxiety disorders (that is, most strongly to social anxiety), so the protective effects of extraversion in combination with low conscientiousness may emerge for social anxiety disorder only. In addition, depression has a particularly large neuroticism or general distress component, and it may be that low-risk traits are also important in protecting against other disorders characterized by high levels of neuroticism and general distress (i.e., GAD, PDD, PTSD; Watson & Naragon-Gainey, 2014; Watson et al., 2005). Though the examination of this three-way interaction in the anxiety disorders is exploratory due to a lack of prior studies analyzing specific anxiety symptoms, we tentatively hypothesize that the three-way interaction will be observed or strongest when predicting social anxiety, PDD, GAD, and PTSD, but weaker or absent for panic, agoraphobia, and OCD.

The current study is the first to examine these effects with a method other than self-report, and our use of interview-based assessment of disorders reduces the effects of shared method variance between the predictors and outcomes. In addition, the personality measures in the current study are different than those in prior studies, which extends the examination of the generalizability of effects over different measures and trait conceptualizations. We selected two common omnibus personality inventories (the NEO Personality Inventory-3 First Half [NEO PI-3FH; McCrae, Costa, & Martin, 2005] and Personality Inventory for DSM-5 [PID-5; Krueger, Derringer, Markon, Watson, & Skodol, 2012], both of which include neuroticism-, extraversion-, and conscientiousness-related traits. Analysis of both measures allows us to examine the robustness and consistency of effects, beyond measure-specific properties.

## 2. Method

### 2.1. Participants and procedure

We analyzed data collected as part of a larger study to develop a new measure of personality pathology traits (CAT-PD; see Simms et al., 2011, for further details). Participants were recruited from mental health treatment centers in Western New York; they were eligible to participate if they were 18 years of age or older and reported receiving psychiatric treatment within the past two years. The final sample consisted of 628 participants. For the current

<sup>1</sup> These studies did not use the Five Factor traits, but rather the related constructs described previously (i.e., negative affectivity and positive affectivity, behavioral inhibition system and behavioral activation system, effortful control).

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