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Can One's Temper be Cooled?: A Role for Agreeableness in Moderating Neuroticism's Influence on Anger and Aggression

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Abstract

The study followed from the idea that neuroticism captures hot or facilitative vulnerabilities related to anger and aggression, whereas agreeableness captures cool or inhibitory processes in relation to these same outcomes. As such, it was predicted that neuroticism and agreeableness should interact to predict anger and aggression according to hot/cool models of self-regulation. This hypothesis was systematically examined among three independent samples of participants (total $N = 176$). As predicted, neuroticism and agreeableness interacted to predict anger and aggression among all samples, and did so in a manner consistent with the hypothesis that neuroticism-anger relations would be lower at high levels of agreeableness. The results therefore highlight the distinct roles of neuroticism and agreeableness in predicting anger and aggression, while placing these traits in a common interactive self-regulatory framework.

Keywords

Neuroticism; Agreeableness; Anger; Aggression; Self-Regulation

The personality traits of neuroticism and agreeableness are often, if not typically, uncorrelated (John & Srivastava, 1999), yet both predict outcomes related to anger and aggression (Martin, Watson, & Wan 2000). Such data are intriguing because they suggest that there are two quite different trait-related influences on anger and aggression, one that facilitates such outcomes (i.e., neuroticism) and one that inhibits such outcomes (i.e., agreeableness). Beyond this correlational level of analysis, it may also be that neuroticism and agreeableness *interact* to predict anger and aggression, and do so in a manner that is consistent with self-regulation theories involving hot and cool personality-related influences. More specifically, we predicted that neuroticism-anger relations would be quite a bit stronger among individuals low in agreeableness. Although this prediction is novel to the literature, it is nevertheless consistent with prior theory and data. In support of this point, we first review relevant data involving neuroticism and agreeableness before presenting an interactive model of these personality-related influences.

Neuroticism, Anger, and Aggression

Individuals higher in neuroticism report higher levels of anger just as they report higher levels of other negative emotions like anxiety, sadness, and guilt (Watson & Clark, 1984). The

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strength of these relationships is such that some prominent models of trait neuroticism suggest that it can be labeled in terms of “negative affectivity” -- i.e., the broad tendency to experience aversive emotional states (Clark & Watson, 1999; Watson, 2000). Although anger is merely one of a number of aversive states linked to high neuroticism, the connection between neuroticism and anger is clearly robust.

Other data add to our understanding of how and why neuroticism is linked to anger and aggression. Neurotic individuals not only report higher levels of irritation, annoyance, and contempt (Watson, 2000), but they also endorse coping strategies that demonstrably exacerbate interpersonal conflicts (Bolger & Schilling, 1991; Bolger & Zuckerman, 1995). Moreover, the link between neuroticism and interpersonal conflicts is not particular to self-reported outcomes variables, as it has also been shown that spouses of neurotic partners view their marriages as more conflicted than do spouses of stable partners (Buss, 1991). Indeed, neuroticism has a unique ability to predict divorce in longitudinal designs (Kelly & Conley, 1987). These sources of data therefore link neuroticism to interpersonal conflict as well as to subjective states of anger.

What accounts for the relationship between neuroticism on the one hand and anger and aggression on the other? A good deal of relevant research has highlighted the negative reactivity processes associated with higher levels of neuroticism. Individuals high in neuroticism have been shown to be more reactive to both laboratory inductions of negative emotions (e.g., Gross, Sutton, & Ketelaar, 1998) and to stressors in daily life (e.g., Bolger & Schilling, 1991). Findings such as these suggest that individuals high in neuroticism may be more prone to anger and aggression primarily because they are more reactive to negative events (e.g., Bolger & Schilling, 1991). This sort of reactivity perspective is consistent with prominent models of reactive aggression, such as that of Anderson and Bushman (2002), which contends that negative affect, regardless of its source, exacerbates aggression in response to provocation. Neuroticism, as a dispositional variable, therefore seems quite consistent with “hot” or facilitative influences on anger and aggression.

Agreeableness, Anger, and Aggression

In relation to their zero-order correlates with negative affective states, neuroticism and agreeableness are quite different. Whereas neuroticism predicts a wide variety of negative emotions, agreeableness predicts lower levels of anger specifically considered (e.g., relative to sadness- or guilt-related emotions: Watson, 2000). Indeed, it has been posited that agreeable individuals are particularly motivated to avoid emotions, such as anger, that might lead to or exacerbate interpersonal conflicts (Graziano & Tobin, 2002). To be agreeable, from this perspective, means to possess skills and abilities related to suppressing hostility-related feelings and response tendencies before they arise.

Findings from our own lab provide additional support for the relationship between agreeableness and the self-regulation of hostile thoughts. In one investigation, we both measured and manipulated the accessibility of hostile thoughts and found that accessible hostile thoughts predicted anger and aggression, but only among individuals low in agreeableness. Among individuals high in agreeableness, this relationship was decoupled such that it was nonsignificant at high levels of agreeableness (Meier & Robinson, 2004). This suggested to us that agreeable, but not disagreeable, individuals are more wont to, or more capable of, self-regulating their tendencies toward anger and aggression (for replication and extension of this view, see Meier, Robinson, & Wilkowski, 2006; Wilkowski, Robinson, & Meier, 2006). In short, our research has supported the view that agreeable individuals are better able to “cool” or inhibit tendencies toward anger and aggression.

A Hot/Cool Analysis and an Interactive Hypothesis

We have suggested that neuroticism constitutes a “hot” or emotional influence on anger and aggression, whereas agreeableness constitutes a “cool” or inhibitory influence on anger and aggression. Our reference to hot and cool elements is consistent with both historical and modern approaches to self-regulation. Historically, Freud (1926) highlighted the intrapsychic battle between the id, a “seething cauldron” of primitive motivational forces, and the ego, an executive component of mind responsible for managing such forces in a rational manner (for a historical overview, see Westen, 1998). A number of more recent models of self-regulation, such as those of Baumeister (e.g., Baumeister, Muraven, & Tice, 2000), Mischel (e.g., Mischel & Ayduk, 2004), and Lieberman (e.g., Lieberman, 2003), similarly highlight the interactive dynamics of hot and cool processes in determining emotion and behavior.

The formal characteristics of hot and cool systems were the systematic focus of Metcalfe and Mischel (1999), although similar principles can be derived from other two-process theories such as that of Deutsch and Strack (2006). Beyond suggesting that the brain consists of both hot/emotional and cool/inhibitory processes, Metcalfe and Mischel suggested that such processes tend to interact in a specific way. Hot processes, whether appetitive (e.g., giving in to temptation) or aversive (e.g., lashing out when one is feeling irritable) in nature, have a stronger influence over behavior when cool processes are relatively inactive. Metcalfe and Mischel reported behavioral, cognitive, and biological data in favor of this specific sort of interaction. Moreover, this interactive perspective is also consistent with a large body of research findings reported in the literature on emotional and behavioral self-regulation (e.g., Eisenberg, Fabes, Guthrie, & Reiser, 2000; Muraven & Baumeister, 2000; Ochsner & Gross, 2004).

Building on such frameworks (e.g., Metcalfe & Mischel, 1999; Mischel & Ayduk, 2004), we predicted that neuroticism (a “hot” influence) and agreeableness (a “cool” influence) would systematically interact with each other in a number of specific ways to predict anger and aggression. First, the strength of relations between neuroticism and our outcome measures should be stronger at low levels of agreeableness and weaker at high levels of agreeableness. This prediction is consistent with the idea that hot influences are more consequential when cool influences are weak (Metcalfe & Mische, 1999). Second, the strength of relations between agreeableness and our outcome measures should be stronger at high levels of neuroticism and weaker at low levels of neuroticism. This prediction is consistent with the idea that cool influences matter most when hot influences are strong (Metcalfe & Mischel, 1999). Third, anger and aggression should be particularly high in the context of high neuroticism and low agreeableness. This prediction is consistent with the idea that impulsive and emotional outcomes are particularly likely when hot influences are strong and cool influences are weak (Metcalfe & Mischel, 1999). We examined such predictions in relation to trait measures of anger and aggression and did so in three independent samples.

Overview of the Investigation

We examined potential interactions between neuroticism and agreeableness in the prediction of anger- and aggression-related outcome variables. We predicted that neuroticism and agreeableness would interact in this respect such that neuroticism-outcome relations would be stronger among individuals low in agreeableness. To assess this prediction in the most convincing manner possible, we sought to replicate the same interaction, in relation to the same dependent measure, across three independent samples of participants.

In doing so, we assessed tendencies toward anger and aggression by administering Spielberger’s Trait Anger Scale (1988). Although this scale is termed an “anger” scale, it is apparent that it actually combines tendencies toward anger and aggression. For example, the

item “When I get frustrated, I feel like hitting someone” combines the presence of anger with the likelihood of aggressing when angered. This combination of anger and aggression makes sense as they are highly related from an emotional reactivity point of view (Anderson & Bushman, 2002; Berkowitz, 1993). In addition, the present predictions are specifically focused on the type of emotional reactivity processes assessed by Spielberger’s (1988) scale, rendering this outcome measure a particularly useful one in the present context.

However, it also seemed useful to assess more specific tendencies toward anger and aggression using a multi-dimensional anger and aggression scale, which we added to the assessment protocol in Sample 3. In relation to this sample, the Buss and Perry (1992) scale attempts to differentiate hostility, anger, and aggression, in line with a tripartite distinction of anger-related thoughts, feelings, and behaviors (Martin et al., 2000). Therefore, Sample 3 should be useful in locating the source of the present interaction. We specifically predicted that neuroticism and agreeableness would interact to predict the three emotion-related scales of the Buss and Perry (1992) questionnaire, but not the subscale focused on non-reactive tendencies toward chronic hostile thoughts and cynicism. Results along these lines would support the discriminant validity of our findings by showing that the predicted interaction is specific to emotional forms of anger and aggression.

Given the novel nature of our predictions, it was decided to focus on self-reported levels of trait anger and aggression. It is important to note that the trait measures we administered have shown to be valid in predicting relevant outcomes such as state anger following a provocation (Deffenbacher, 1992; Deffenbacher et al., 1996), aggression likelihood in the lab and everyday life (Bettencourt, Talley, Benjamin, & Valentine, 2006), and informant reports of anger and aggression (Buss & Perry, 1992; Martin et al., 2000). Because of the similar nature of the variables across samples, we present the method and results sections for all samples together rather than individually.

Method

Participants

Samples 1, 2, and 3 involved independent groups of undergraduate volunteers from North Dakota State University seeking extra credit for their psychology classes. There were 51 participants in Sample 1 (29 female), 64 participants in Sample 2 (40 female), and 61 participants in Sample 3 (45 female). All samples were predominantly Caucasian in race (80%, 95%, & 80% in Samples 1, 2, & 3, respectively). In initial analyses, we sought to examine whether sex moderated the neuroticism by agreeable interactions reported below and found that this was not the case in any of the samples for any of the dependent variables (all $ps > .2$). We therefore collapse across participant sex in the analyses reported below.

Measures

Neuroticism and Agreeableness—Neuroticism and agreeableness were both assessed by Goldberg’s (1999) IPIP scales, which we have used in numerous past studies (e.g., Robinson & Wilkowski, 2006). For both scales, participants were asked to indicate the extent to which a number of statements accurately described them (1 = very inaccurate; 5 = very accurate). The neuroticism scale consisted of 10 items that were indicative of high (e.g., “worry about things”) versus low (e.g., “am relaxed most of the time”) levels of neuroticism. Similarly, the agreeableness scale also consisted of 10 items that were indicative of high (e.g., “am interested in others”) versus low (e.g., “feel little concern for others”) levels of agreeableness. Goldberg (1999; in press) has reported extensive evidence for the reliability and validity of these Big 5 scales. In the present samples, alphas ranged from .86–.89 for neuroticism and from .67–.77 for agreeableness.

Trait Anger (Spielberger, 1988)—All three samples assessed trait anger in relation to the Spielberger (1988) trait anger scale. Specifically, participants were asked to indicate the extent to which 10 items indicative of high levels of aggressive forms of anger (e.g., “I have a fiery temper”) could be used to describe them (1 = almost never; 4 = almost always). Alphas for this scale ranged from .82–.90 in the present samples.

Trait Anger and Aggression (Buss & Perry, 1992)—Participants in Sample 3, but not Samples 1 or 2, also completed Buss and Perry’s (1992) multi-dimensional trait aggression scale. This scale includes four subscales designed to tap individual differences in cynical hostility (8 items; e.g., “I know that ‘friends’ talk about me behind my back”), anger (7 items; e.g., “I have trouble controlling my temper”), verbal aggression (5 items; e.g., “When people annoy me, I may tell them what I think of them”), and physical aggression (9 items; e.g., “Once in a while I can’t control the urge to strike another person”). All subscales use the same 1 (strongly disagree) to 5 (strongly agree) response options. The four subscales are empirically distinct, yet correlated positively with each other to a moderate degree. Buss and Perry (1992) report other evidence for the reliability and validity of the scales. In the present sample, alphas ranged from .73–.88.

Procedure

In all three samples, care was taken to ensure that the questionnaires were completed in a reliable and valid manner. All participants were told that their responses would be confidential and that they should answer each item truthfully. Furthermore, to preclude the possibility that thinking about one’s traits could affect dependent measure reports, anger and aggression measures were administered prior to the assessment of neuroticism and agreeableness. Measures were completed in private cubicles via personal computers.

Results

Correlations Involving the Spielberger (1988) Trait Anger Scale

Correlations among neuroticism, agreeableness, and Spielberger Trait Anger scores are shown in Table 1. As shown there, neuroticism was a robust predictor of trait anger, whereas this was a bit less true of agreeableness. It seems that the Spielberger Trait Anger scale primarily taps emotional reactivity processes linked to neuroticism relative to the inhibitory processes linked to agreeableness. However, there was a significant negative correlation between agreeableness and Spielberger Trait Anger scores in two of the three samples. Table 1 also shows that relations between neuroticism and agreeableness tended to be negative, and were significantly so in two of the three samples. However, the correlations were moderate rather than large, which is consistent with the view that these are largely independent dimensions of personality.

Correlations Involving Buss-Perry (1992) Aggression Subscales

The Buss and Perry (1992) multi-dimensional scale was administered to sample 3 to gain further insight into potential interactions between neuroticism and agreeableness. Correlations between neuroticism and agreeableness and the subscales of the Buss and Perry questionnaire are reported in Table 2. As shown there, neuroticism correlated positively with all subscales of the Buss and Perry scale, whereas agreeableness correlated negatively with all subscales of the Buss and Perry scale. It was notable that the correlation between neuroticism and anger was quite a bit higher than was the correlation between agreeableness and anger. However, in relation to the behavioral aggression subscales, neuroticism and agreeableness had somewhat equal predictive value. This suggests that scales emphasizing anger tend to correlate more highly with neuroticism, whereas scales related to aggression are somewhat equally predicted by both neuroticism and agreeableness.

Interactive Predictions: Spielberger (1988) Trait Anger

To examine our interactive hypothesis, we *z*-scored Neuroticism and Agreeableness and then computed an interaction term by multiplying these *z*-scores (Aiken & West, 1991). For each sample separately, we then performed a multiple regression in which trait anger scores were simultaneously regressed on Neuroticism, Agreeableness, and the Neuroticism \times Agreeableness interaction term (all *z*-scored). Neuroticism was a significant predictor of Spielberger Anger scores in all samples: Sample 1, $t = 7.75, p < .01$; Sample 2, $t = 5.92, p < .01$; Sample 3, $t = 6.39, p < .01$. Agreeableness was a significant predictor of Spielberger Anger scores in Sample 3, but not Samples 1 and 2: Sample 1, $t = -0.76, p > .40$; Sample 2, $t = -1.10, p > .25$; Sample 3, $t = -2.72, p < .01$. These results are comparable to the correlations reported in Table 1 in suggesting that, at the zero-order level, neuroticism is a more robust predictor of trait anger than agreeableness.

Of more importance, all multiple regressions also resulted in a significant Neuroticism \times Agreeableness interaction: Sample 1, $t = -3.08, p < .01$; Sample 2, $t = -3.60, p < .01$; Sample 3, $t = -4.36, p < .01$. To understand the nature of these interactions, we estimated trait anger scores for individuals low (-1 *SD*) and high ($+1$ *SD*) in Neuroticism who were low (-1 *SD*) and high ($+1$ *SD*) in Agreeableness (Aiken & West, 1991). These estimated means are graphically displayed in the top (Sample 1), middle (Sample 2), and bottom (Sample 3) panels of Figure 1. As shown there, Neuroticism-trait anger relations were apparently weaker at high levels of Agreeableness, supporting our interactive predictions.

To quantify the predictive effects of Neuroticism at low (-1 *SD*) and high ($+1$ *SD*) levels of Agreeableness, we performed simple slopes analyses as outlined by Aiken and West (1991). In Sample 1, the relation between Neuroticism and trait anger was significant at both low, $t = 7.25, p < .01, \beta = 1.02$, and high, $t = 3.51, p < .01, \beta = .44$, levels of Agreeableness; yet, Neuroticism was a much stronger predictor at low ($\beta = 1.02$) relative to high ($\beta = 0.44$) levels of Agreeableness. In Sample 2, the relation between Neuroticism and trait anger was significant at low levels of Agreeableness, $t = 6.47, p < .01, \beta = .91$, but not at high levels of Agreeableness, $t = 1.65, p > .10, \beta = .22$. Similarly, in Sample 3, the relation between Neuroticism and trait anger was significant at low levels of Agreeableness, $t = 8.15, p < .01, \beta = .90$, but not at high levels of Agreeableness, $t = 1.54, p > .10, \beta = .19$. Thus, consistent with our interactive predictions, the data reveal that neuroticism was a stronger predictor of trait anger at low, relative to high, levels of agreeableness.

As another way of examining the interaction, we examined the effects of Agreeableness at low (-1 *SD*) and high ($+1$ *SD*) levels of Neuroticism. As Figure 1 suggests, simple slope analyses revealed that Agreeableness was particularly influential at high levels of Neuroticism. In Sample 1, Agreeableness predicted trait anger at high, $t = -2.93, p < .01, \beta = -.36$, but not low, $t = 1.53, p > .10, \beta = .22$, levels of Neuroticism. Similarly, in Sample 2, Agreeableness predicted trait anger at high, $t = -3.92, p < .01, \beta = -.46$, but not low, $t = 1.52, p > .10, \beta = .24$, levels of Neuroticism. Such effects were replicated in Sample 3, in that Agreeableness predicted trait anger at high, $t = -5.06, p < .01, \beta = -.59$, but not low, $t = 1.04, p > .30, \beta = .12$, levels of Neuroticism. Thus, agreeableness predicted trait anger at high levels of neuroticism, but not at low levels of neuroticism, and such simple slope results were consistent across all three samples.

In sum, the results support the hypothesis that neuroticism and agreeableness interact to predict trait anger, a result not previously shown in the literature. Specifically, neuroticism was particularly predictive of trait anger at low levels of agreeableness, whereas agreeableness was particularly predictive of trait anger at high levels of neuroticism. Furthermore, individuals high in neuroticism and low in agreeableness were highest in trait anger, a result quite consistent with the hot/cool self-regulation framework that guided our predictions.

Interactive Predictions: Buss-Perry (1992) Subscale Scores

The Buss and Perry questionnaire has separable subscales related to anger, physical aggression, verbal aggression, and hostility. Accordingly, an examination of the potential interaction of neuroticism and agreeableness in the context of these subscales should be helpful in delineating the scope and locus of our interactive findings. Because we viewed the interaction as one involving emotional reactivity processes somewhat specifically, we predicted that neuroticism and agreeableness would interact to predict the subscales closely linked to reactive forms of anger and aggression, but not chronic tendencies toward hostile thoughts and cynicism, as measured by the hostility subscale (e.g., “Other people always seem to get the breaks”).

To examine such predictions in Sample 3, we *z*-scored Neuroticism and Agreeableness and entered them, as well as their interaction term, into a multiple regression predicting scores on each the four Buss-Perry subscales considered separately. In predicting Buss-Perry Anger, there was a main effect for Neuroticism, $t = 8.03, p < .01$, no main effect for Agreeableness, $t = -1.15, p > .25$, and a significant Neuroticism \times Agreeableness interaction, $t = -2.92, p < .01$. This replicates the Spielberger data reported above in the context of an anger scale that attempts to measure anger somewhat independently of tendencies toward aggression.

In predicting physical aggression, there were main effects for both Neuroticism, $t = 2.42, p < .05$, and Agreeableness, $t = -4.41, p < .01$, as well as a Neuroticism \times Agreeableness interaction, $t = -3.40, p < .01$. Similarly, in the prediction of verbal aggression, effects for Neuroticism, $t = 3.23, p < .01$, Agreeableness, $t = -3.69, p < .01$, and the Neuroticism \times Agreeableness interaction, $t = -3.34, p < .01$, were all significant predictors. Thus, in the context of behavioral tendencies toward aggression, neuroticism and agreeableness were equally predictive. However, these main effects were qualified by the significant neuroticism by agreeableness interaction that was predicted.

In the final regression predicting individual differences in hostility, there was a main effect for Neuroticism, $t = 5.47, p < .01$, but no main effect for Agreeableness, $t = -1.56, p > .10$, and no Neuroticism \times Agreeableness interaction, $t = -1.15, p > .25$. Thus, the consideration of the separate Buss-Perry subscales indicates that the interaction between neuroticism and agreeableness has more relevance to the subjective (i.e., anger) and behavioral (i.e., physical & verbal aggression) components of aggression relative more chronic tendencies to view others with hostility and cynicism.

To interpret the significant interactions related to the Buss-Perry anger, physical aggression, and verbal aggression subscales, we estimated subscale means for individuals low ($-1 SD$) and high ($+1 SD$) in Neuroticism who were low ($-1 SD$) and high ($+1 SD$) in Agreeableness (Aiken & West, 1991). The estimated means, displayed in Figure 2, reveal that all interactions were of a parallel form in that the highest tendencies toward anger and aggression were observed among those (a) high in Neuroticism and (b) low in Agreeableness. This was especially apparent in relation to the outcome measures specific to aggression. Indeed, in relation to these aggression scales, there was no apparent relationship between Neuroticism and aggression at high levels of Agreeableness.

To gain a further understanding of the interactions for the reactivity-related Buss-Perry subscales, we performed follow-up simple slopes analyses. The relation between Neuroticism and Buss-Perry anger was significant at both low ($-1 SD$), $t = 8.35, p < .01, \beta = .92$, and high ($+1 SD$), $t = 3.60, p < .01, \beta = .45$, levels of Agreeableness, but was clearly more pronounced at low levels of Agreeableness ($\beta = .92$ versus $.45$). As the graph reported in Figure 2 suggests, Neuroticism predicted physical aggression at low, $t = 4.37, p < .01, \beta = .57$, but not high, $t = -0.56, p > .50, \beta = -.08$, levels of Agreeableness. Similarly, Neuroticism predicted verbal aggression at low, $t = 4.95, p < .01, \beta = .65$, but not high, $t = 0.04, p > .90, \beta = .01$, levels of

Agreeableness. In sum, it was particularly striking that Neuroticism did not predict behavioral manifestations of aggression at high levels of Agreeableness.

We next turned to simple slopes analyses examining effects of Agreeableness at low ($-1 SD$) and high ($+1 SD$) levels of Neuroticism. In relation to Buss-Perry anger, Agreeableness was predictive at high, $t = -2.89, p < .01, \beta = -.33$, but not low, $t = 1.17, p > .20, \beta = .14$, levels of Neuroticism. Similarly, Agreeableness was related to physical aggression at high, $t = -5.64, p < .01, \beta = -.77$, but not low, $t = -0.82, p > .40, \beta = -.12$, levels of Neuroticism. Finally, Agreeableness was related to verbal aggression at high, $t = -5.06, p < .01, \beta = -.70$, but not low, $t = -0.36, p > .70, \beta = -.05$, levels of Neuroticism. Thus, in all cases, Agreeableness was significantly related to anger and aggression at high levels of Neuroticism, but not at low levels of Neuroticism, supporting the critical role of agreeableness in regulation of neuroticism-linked vulnerabilities to reactive forms of anger and aggression.

Discussion

Summary of Findings

Just as fuel and water interactively determine the strength of a fire, we hypothesized that neuroticism and agreeableness would interactively predict tendencies toward anger and aggression. Additional predictions follow from this metaphor. Just as water would be more palliative given some tendency toward a fire, we predicted that agreeableness would be more consequential at high levels of neuroticism. Similarly, as fuel would have a greater impact given the absence of water, we predicted that neuroticism would be more consequential at low levels of agreeableness. Overall, then, just as the intensity of a fire will be strongest when there is an abundance of fuel and an absence of water, we predicted that anger and aggression would be highest among those (a) high in neuroticism and (b) low in agreeableness.

The present study supported these interactive predictions. In all three samples, the highest levels of trait anger (as measured by the well-validated Spielberger scale, 1988) were particular to individuals (a) high in neuroticism and (b) low in agreeableness. Moreover, agreeableness only predicted anger at high levels of neuroticism, and neuroticism tended to predict anger only at low levels of agreeableness. What emerges from the interactive findings is the suggestion that neuroticism is a necessary, but not sufficient, precondition for high levels of trait anger. Without tendencies toward neuroticism, there is low trait anger. With these tendencies, there is a predisposition toward trait anger, but high agreeableness can serve to inhibit this relation.

Sample 3 extended the findings by focusing on individual differences in aggression-related cognition, affect, and behavior, using the Buss and Perry (1992) Aggression Questionnaire. Because the interaction of interest was not apparent in relation to aggression-related cognitions (i.e. hostility), but was apparent in relation to the other subscales of the Buss and Perry questionnaire, it appears that neuroticism and agreeableness interact to predict reactive emotional outcomes, but not non-reactive tendencies to view others with hostility. This was a helpful contribution to the study as it places the interaction in the domain of emotional reactivity processes, which is consistent with the hot/cool emotional reactivity frameworks that guided our predictions.

A Hot/Cool Analysis of the Interactive Findings

It is striking how well our fire/water metaphor maps onto the hot/cool analysis of Metcalfe and Mischel (1999). We have proposed that neuroticism “fuels” tendencies toward anger and aggression, possibly due to the limbic system correlates of negative affectivity (Gontkovsky, 2005; LeDoux, 1995). Similarly, Metcalfe and Mischel (1999) have highlighted the manner in

which negative affect shifts the individual toward an impulsive mode of thought and action, including tendencies toward anger and aggression (see also Bechara, Noel, & Crone, 2006; Robinson & Berridge, 2001). In the language of Metcalfe and Mischel (1999), neuroticism would activate the “hot” circuits associated with impulsivity, anger, and aggression.

However, Metcalfe and Mischel (1999) further proposed that human beings possess “cool” circuitry capable of diffusing tendencies toward emotional reactivity. Such circuits primarily involve the hippocampus and components of the frontal lobes, which have long been known to play a major role in the self-regulation of emotional impulses (for a review, see Banfield, Wyland, Macrae, Münte, & Heatherton, 2004). According to the analysis of Metcalfe and Mischel (1999), activation of “cool” nodes deactivates activation of “hot” nodes, much as areas of the frontal lobes deactivate activation of the amygdala (Davidson, 1999; Ochsner & Gross, 2004). In the language of Metcalfe and Mischel (1999), agreeableness would be linked to the “cool” circuits associated with self-regulation.

Thus, by mapping neuroticism to “hot” emotional processes and agreeableness to “cool” self-regulation processes, we were able to take full advantage of Metcalfe and Mischel’s (1999) theoretical model of self-regulation. First, the hot and cool processes associated with neuroticism and agreeableness, respectively, should result in some inverse relation between these traits, which was found here to some extent (for a theoretical interpretation of such inverse relations, which appear robust, though modest, see Jang et al., 2001). Second, the likelihood of anger and aggression should interactively vary by hot and cool modes of cognition, here in terms of robust interactions between neuroticism and agreeableness in predicting anger and aggression outcome variables. Clearly, such potential interactions were systematically supported here, which is a novel finding in relation to the adulthood literature on neuroticism and agreeableness.

Third and fourth, such a hot/cool framework is also consistent with the simple slopes results that we reported above. Just as hot influences should matter most given a lack of cool inhibition, we found that neuroticism was most consequential at low levels of agreeableness. Additionally, just as cool influences should matter most given some tendency toward the activation of hot modes of cognition, we found that agreeableness was most consequential at high levels of neuroticism. In sum, the present results rely upon, but significantly extend, the analysis of self-regulation processes presented by Metcalfe and Mischel (1999), but do so in a way better linking trait and process-oriented views of personality.

Additional Considerations

Our analysis of agreeableness in terms of self-regulation processes is not foreign to the literature of personality and is, in fact, an increasingly viable process-oriented framework for this trait. In the developmental literature, agreeableness has been linked to effortful control, defined in terms of abilities to control dominant responses prone to error (e.g., Cumberland-Li, Eisenberg, & Reiser, 2004). The adulthood literature has also reported systematic relations between agreeableness on the one hand and dispositional self-control (e.g., Tangney, Baumeister, & Boone, 2004) and cognitive control abilities (e.g., Jensen-Campbell et al., 2002) on the other. Moreover, our lab has shown, in several investigations, that agreeable individuals are more capable of controlling activated hostile thoughts (e.g., see Wilkowski & Robinson, 2007, for a review). Thus, the link of agreeableness to the self-regulation of hostile thoughts appears quite sound in general terms.

Another issue relates to the self-report nature of our dependent measures. This is an important concern as there are theoretical frameworks positing a systematic relation between agreeableness and a form of social desirability bias known as impression management (Paulhus & John, 1998). However, extensive data linking agreeableness to the self-regulation of

unwanted thoughts (e.g., Meier et al., 2006), emotional expressions (e.g., Tobin, Graziano, Vanman, & Tassinari, 2000), and behaviors (e.g., Clark & Watson, 1999) indicates that the link between agreeableness and self-regulation processes cannot be simply ascribed to impression management concerns (for a review and other relevant data, see Graziano & Tobin, 2002). This said, we do view it important to replicate the present interactive findings with respect to dependent measures that do not rely on self-report, such as observer reports of personality or physiological measurements of distress (e.g., Shedler, Mayman, & Manis, 1993).

An additional framework worth discussing is one that links agreeableness to positive, low arousal states, such as serenity and contentment (Johnson & Ostendorf, 1993). According to a number of circumplex models of emotion, these positive, low arousal states are inversely related to negative, high arousal states, such as anger (for a review, see Watson, Wise, & Vaidya, 1999), thus providing a possible non-cognitive explanation for our results. However, there are reasons to doubt such an alternative framework for the present findings.

Although agreeableness is inversely related to anger, it is not related to other negative, high arousal states more generally considered (Watson, 2000). Thus, there again appears to be a particular relation between agreeableness and the self-regulation of hostile thoughts and feelings relative to other negative affective states. Additionally, we note that positive low arousal states are conducive to social functioning (Clark & Watson, 1988) and it could well be that the systematic link of agreeableness to positive low arousal states results from the goals of agreeable individuals to interact positively with others (Graziano & Eisenberg, 1997; Graziano & Tobin, 2002). In other words, systematic links of agreeableness to positive low arousal states are likely to follow from self-regulation goals related to pleasant social interactions (Vohs & Ciarocco, 2004). Finally, we simply note that zero-order relations between agreeableness and affective states of any type would be quite independent of our systematic findings involving *interactions* between neuroticism and agreeableness. This is because the regression procedures used in this study necessarily control for such systematic, zero-order relations between agreeableness and anger and aggression.

Implications Related to Anger and Aggression

Prominent models of anger and aggression provide an excellent account of situational inputs to aggression such as momentary mood states (Berkowitz, 1993), heat (Anderson, 2001), and media violence (Bushman & Anderson, 2001). However, such models have typically emphasized the excitatory inputs to aggression somewhat exclusively, relative to possible inhibitory relations. Conversely, our research has provided consistent evidence suggestive of such inhibitory relations, specifically in terms of trait agreeableness (e.g., Meier & Robinson, 2004; Meier et al., 2006).

In fact, we (e.g., Meier & Robinson, 2004) have suggested that agreeableness cannot be easily integrated with the social cognitive view that aggression is a straightforward reflection of the accessibility of hostility-related thoughts and feelings (for a recent review, see Robinson, in press). Measures and manipulations of such hostile thoughts have been found to be relatively inconsequential at high levels of agreeableness, but consequential at low levels of agreeableness (Meier & Robinson, 2004; Meier et al., 2006). Agreeableness, then, seems to involve self-regulation processes -- i.e., those related to inhibiting aggression-related thoughts and feelings when they occur (Meier & Robinson, 2004; Meier et al., 2006; Robinson, in press). Therefore, it seems important to incorporate such individual difference variables into more comprehensive models of anger and aggression, such as those highlighted by Bettencourt et al. (2006) or Wilkowski and Robinson (2007).

Conclusions

In the current investigation, we hypothesized that neuroticism and agreeableness would interactively predict anger and aggression outcome variables. As hypothesized, neuroticism and agreeableness interacted with each other, such that the highest levels of anger and aggression were observed among individuals high in neuroticism and low in agreeableness. The findings point to the important role that agreeableness plays in the self-regulation of negative affect. More generally, the findings also highlight the manner in which Big 5 traits may interact with each other in predicting relevant outcome variables, and do so in a way to support self-regulation theories of the sort presented by Metcalfe and Mischel (1999).

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References

- Aiken, L.S.; West, S.G. *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA: Sage Publications; 1991.
- Anderson CA. Heat and violence. *Current Directions in Psychological Science* 2001;10:33–38.
- Anderson CA, Bushman BJ. Human aggression. *Annual Review of Psychology* 2002;53:27–51.
- Banfield, JF.; Wyland, CL.; Macrae, CN.; Münte, TF.; Heatherton, TF. The cognitive neuroscience of self-regulation. In: Baumeister, RF.; Vohs, KD., editors. *Handbook of self-regulation: Research, theory, and applications*. New York: Guilford Press; 2004. p. 62-83.
- Baumeister RF, Muraven M, Tice DM. Ego depletion: A resource model of volition, self-regulation, and controlled processing. *Social Cognition* 2000;18:130–150.
- Bechara, A.; Noel, X.; Crone, EA. Loss of willpower: Abnormal neural mechanisms of impulse control and decision making in addiction. In: Wiers, RW.; Stacy, AW., editors. *Handbook of implicit cognition and addiction*. Thousand Oaks CA: Sage Publications; 2006. p. 215-232.
- Berkowitz, L. *Aggression: Its causes, consequences, and control*. New York: McGraw-Hill; 1993.
- Bettencourt BA, Talley A, Benjamin AJ, Valentine J. Personality and aggressive behavior under provoking and neutral conditions: A meta-analytic review. *Psychological Bulletin* 2006;132:751–777. [PubMed: 16910753]
- Bolger N, Schilling EA. Personality and the problems of everyday life: The role of neuroticism in exposure and reactivity to daily stressors. *Journal of Personality* 1991;59:355–386. [PubMed: 1960637]
- Bolger N, Zuckerman A. A framework for studying personality in the stress process. *Journal of Personality and Social Psychology* 1995;69:890–902. [PubMed: 7473036]
- Bushman BJ, Anderson CA. Media violence and the American public: Scientific facts versus media misinformation. *American Psychologist* 2001;56:477–489. [PubMed: 11413871]
- Buss DM. Conflict in married couples: Personality predictors of anger and upset. *Journal of Personality* 1991;59:663–688. [PubMed: 1774615]
- Buss AH, Perry M. The Aggression Questionnaire. *Journal of Personality and Social Psychology* 1992;63:452–459. [PubMed: 1403624]
- Clark LA, Watson D. Mood and the mundane: Relations between daily life events and self-reported mood. *Journal of Personality and Social Psychology* 1988;54:296–308. [PubMed: 3346815]
- Clark, LA.; Watson, D. Temperament: A new paradigm for trait psychology. In: Pervin, LA.; John, OP., editors. *Handbook of personality: Theory and research*. 2nd ed.. New York: Guilford Press; 1999. p. 399-423.
- Cumberland-Li A, Eisenberg N, Reiser M. Relations of young children's agreeableness and resiliency to effortful control and impulsivity. *Social Development* 2004;13:193–212.
- Davidson, R.J. Neuropsychological perspective on affective styles and their cognitive consequences. In: Dalglish, T.; Power, MJ., editors. *Handbook of cognition and emotion*. New York: John Wiley & Sons; 1999. p. 103-123.

- Deffenbacher, J.L. Trait anger: Theory, findings, and implications. In: Spielberger, CD.; Butcher, JN., editors. *Advances in personality assessment*. Vol. 9. Hillsdale, NJ: Erlbaum; 1992. p. 177-201.
- Deffenbacher JL, Oetting ER, Thwaites GA, Lynch RS, Baker DA, Stark RS, et al. State-trait anger theory and the utility of the Trait Anger scale. *Journal of Counseling Psychology* 1996;43:131–148.
- Deutsch, R.; Strack, F. Reflective and impulsive determinants of addictive behavior. In: Wiers, RW.; Stacy, AW., editors. *Handbook of implicit cognition and addiction*. Thousand Oaks CA: Sage Publications; 2006. p. 45-57.
- Eisenberg N, Fabes RA, Guthrie IK, Reiser M. Dispositional emotionality and regulation: Their role in predicting quality of social functioning. *Journal of Personality and Social Psychology* 2000;78:136–157. [PubMed: 10653511]
- Freud, S. *The ego and the id*. Honolulu, HI: Hogarth Press; 1926.
- Goldberg, LR. A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In: Mervielde, I.; Deary, I.; De Fruyt, F.; Ostendorf, F., editors. *Personality Psychology in Europe*. Vol. 7. Tilburg, The Netherlands: Tilburg University Press; 1999. p. 7-28.
- Goldberg, LR. The comparative validity of adult personality inventories: Applications of a consumer-testing framework. In: Briggs, SR.; Cheek, JM.; Donahue, EM., editors. *Handbook of adult personality inventories*. New York: Plenum Publishing Corp.; in press
- Gontkovsky, ST. Neurobiological bases and neuropsychological correlates of aggression and violence. In: Morgan, JP., editor. *Psychology of aggression*. Hauppauge, NY: Nova Science Publishers, Inc.; 2005. p. 101-116.
- Graziano, WG.; Eisenberg, N. Agreeableness: A dimension of personality. In: Hogan, R.; Johnson, JA.; Briggs, SR., editors. *Handbook of personality psychology*. San Diego: Academic Press; 1997. p. 795-824.
- Graziano WG, Tobin RM. Agreeableness: Dimension of personality or social desirability artifact? *Journal of Personality* 2002;70:695–727. [PubMed: 12322857]
- Gross JJ, Sutton SK, Ketelaar T. Relations between affect and personality: Support for the affect-level and affective-reactivity views. *Personality and Social Psychology Bulletin* 1998;24:279–288.
- Jang KL, Livesley WJ, Riemann R, Vernon PA, Hu S, Angleitner A, et al. Covariance structure of neuroticism and agreeableness: A twin and molecular genetic analysis of the role of the serotonin transporter gene. *Journal of Personality and Social Psychology* 2001;81:295–304. [PubMed: 11519933]
- Jensen-Campbell LA, Rosseli M, Workman KA, Santisi M, Rios JD, Bojan D. Agreeableness, conscientiousness and effortful control processes. *Journal of Research in Personality* 2002;36:476–489.
- John, OP.; Srivastava, S. The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In: Pervin, LA.; John, OP., editors. *Handbook of personality: theory and research*. 2nd ed.. New York: Guilford Press; 1999. p. 102-138.
- Johnson JA, Ostendorf F. Clarification of the five-factor model with the Abridged Big Five Dimensional Circumplex. *Journal of Personality and Social Psychology* 1993;65:563–576.
- Kelly EL, Conley JJ. Personality and compatibility: A prospective analysis of marital stability and marital satisfaction. *Journal of Personality and Social Psychology* 1987;52:27–40. [PubMed: 3820076]
- LeDoux JE. Emotion: Clues from the brain. *Annual Review of Psychology* 1995;46:209–235.
- Lieberman, MD. Reflexive and reflective judgment processes: A social cognitive neuroscience approach. In: Forgas, JP.; Williams, KD.; von Hippel, W., editors. *Social judgment: Implicit and explicit processes*. New York: Cambridge University Press; 2003. p. 44-67.
- Martin R, Watson D, Wan CK. A three-factor model of trait anger: Dimensions of affect, behavior, and cognition. *Journal of Personality* 2000;68:869–897. [PubMed: 11001152]
- Meier BP, Robinson MD. Does quick to blame mean quick to anger?: The role of agreeableness in dissociating blame and anger. *Personality and Social Psychology Bulletin* 2004;30:856–867. [PubMed: 15200692]
- Meier BP, Robinson MD, Wilkowski BM. Turning the other cheek: Agreeableness and the regulation of aggression-related primes. *Psychological Science* 2006;17:136–142. [PubMed: 16466421]

- Metcalf J, Mischel W. A hot/cool-system analysis of delay of gratification: Dynamics of willpower. *Psychological Review* 1999;106:3–19. [PubMed: 10197361]
- Mischel, W.; Ayduk, O. Willpower in a cognitive-affective processing system: The dynamics of delay of gratification. In: Baumeister, RF.; Vohs, KD., editors. *Handbook of self-regulation: Research, theory, and applications*. New York: Guilford Press; 2004. p. 99-129.
- Muraven M, Baumeister RF. Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin* 2000;126:247–259. [PubMed: 10748642]
- Ochsner, KN.; Gross, JJ. Thinking makes it so: A social cognitive neuroscience approach to emotion regulation. In: Baumeister, RF.; Vohs, KD., editors. *Handbook of self-regulation: Research, theory, and applications*. New York: Guilford Press; 2004. p. 229-255.
- Paulhus DL, John OP. Egoistic and moralistic biased in self-perception: The interplay of self-deceptive styles with basic traits and motives. *Journal of Personality* 1998;66:1025–1060.
- Robinson, MD. Lives lived in milliseconds: Using cognitive methods in personality research. In: Robins, RW.; Fraley, RC.; Krueger, R., editors. *Handbook of research methods in personality psychology*. New York: Guilford Press; in press
- Robinson TE, Berridge KC. Incentive-sensitization and addiction. *Addiction* 2001;96:103–114. [PubMed: 11177523]
- Robinson MD, Wilkowski BM. Loving, hating, vacillating: Agreeableness, implicit self-esteem, and neurotic conflict. *Journal of Personality* 2006;74:935–978. [PubMed: 16787425]
- Shedler J, Mayman M, Manis M. The illusion of mental health. *American Psychologist* 1993;48:1117–1131. [PubMed: 8259825]
- Spielberger, C. *State-Trait Anger Expression Inventory: STAXI Professional Manual*. Odessa, FL: Psychological Assessment Resources; 1988.
- Tangney JP, Baumeister RF, Boone AL. High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality* 2004;72:271–322. [PubMed: 15016066]
- Tobin RM, Graziano WG, Vanman EJ, Tassinari LG. Personality, emotional experience, and efforts to control emotions. *Journal of Personality and Social Psychology* 2000;79:656–669. [PubMed: 11045745]
- Vohs, KD.; Ciarocco, NJ. Interpersonal functioning requires self-regulation. In: Baumeister, RF.; Vohs, KD., editors. *Handbook of self-regulation: Research, theory, and applications*. New York: Guilford Press; 2004. p. 392-407.
- Watson, D. *Mood and temperament*. New York: Guilford Press; 2000.
- Watson D, Clark LA. Negative affectivity: The disposition to experience aversive emotional states. *Psychological Bulletin* 1984;96:465–490. [PubMed: 6393179]
- Watson D, Wiese D, Vaidya J. The two general activation systems of affect: Structural findings, evolutionary considerations, and psychobiological evidence. *Journal of Personality and Social Psychology* 1999;76:820–838.
- Westen D. The scientific legacy of Sigmund Freud: Toward a psychodynamically informed psychological science. *Psychological Bulletin* 1998;124:333–371.
- Wilkowski BM, Robinson MD. Toward a social cognitive theory of individual differences in anger and anger-related aggression. Manuscript submitted for publication. 2007
- Wilkowski BM, Robinson MD, Meier BP. Agreeableness and the prolonged spatial processing of antisocial and prosocial information. *Journal of Research in Personality* 2006;40:1152–1168.

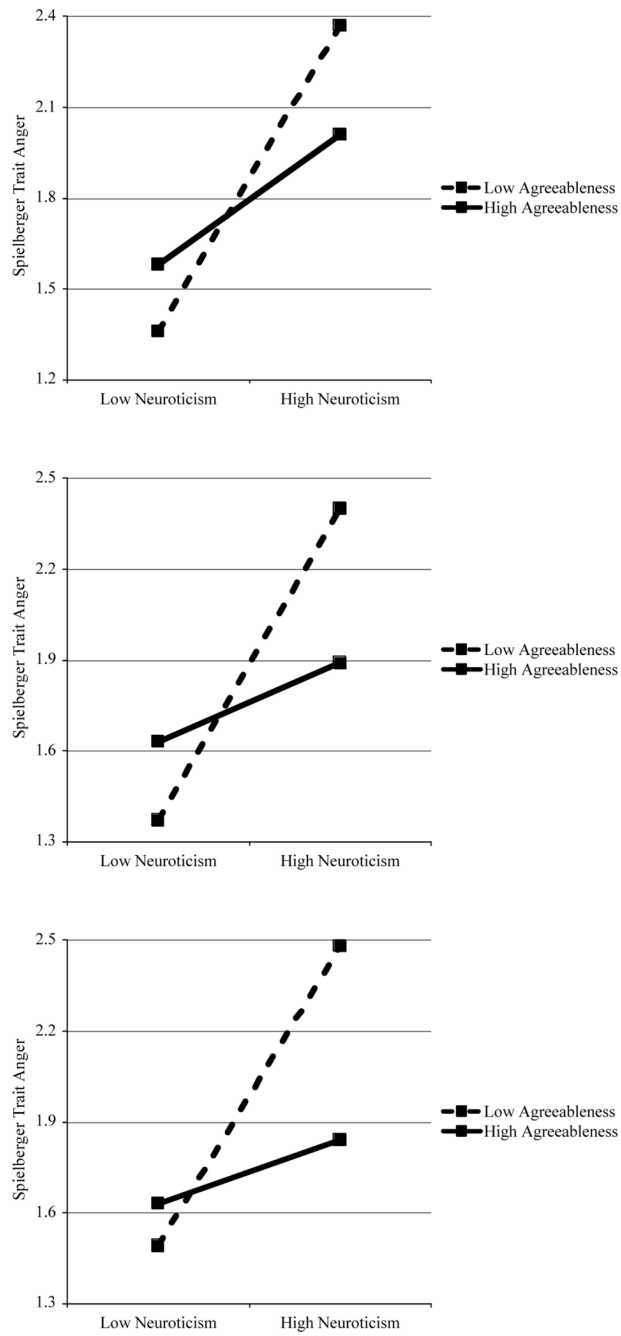


Figure 1. Spielberger Trait Anger Scores as a function of the Neuroticism x Agreeableness Interaction, Sample 1 (Top Panel), 2 (Middle Panel), and 3 (Bottom Panel)

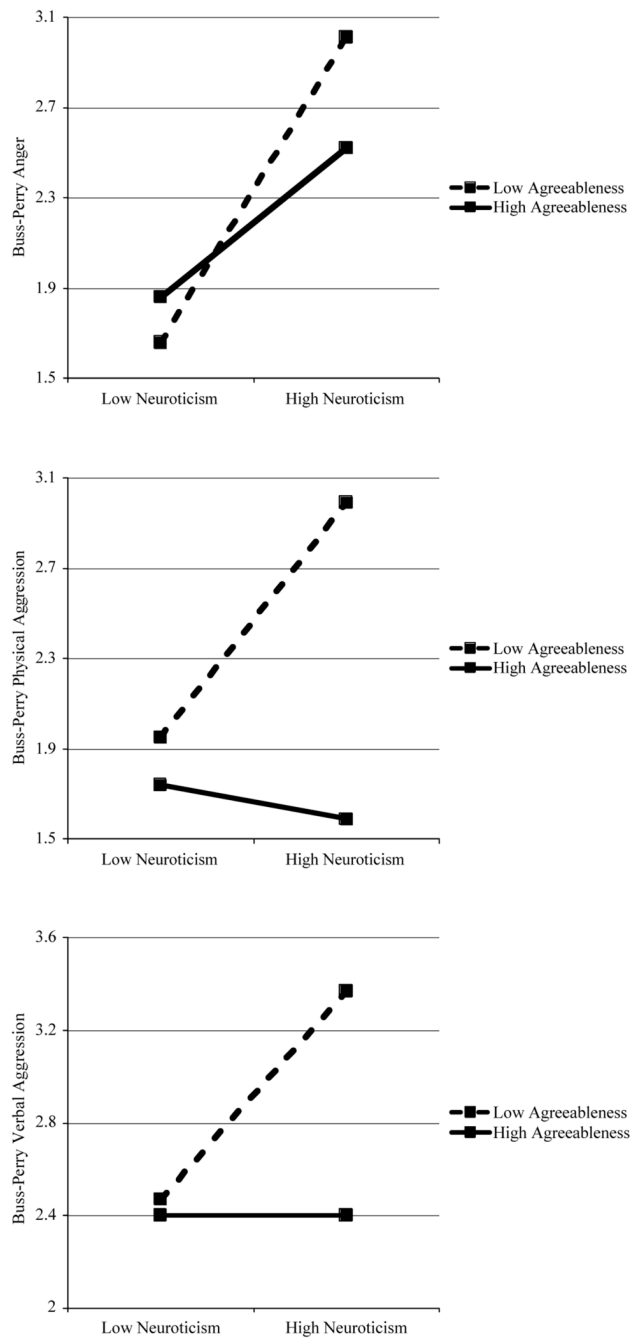


Figure 2. Buss-Perry Anger (Top Panel), Physical Aggression (Middle Panel), and Verbal Aggression (Bottom Panel) as a function of the Neuroticism x Agreeableness Interaction, Sample 3

Table 1

Correlations Among Neuroticism, Agreeableness, and Spielberger Trait Anger for All Samples

Correlation	Sample 1	Sample 2	Sample 3
Neuroticism & Agreeableness	-.10	-.33*	-.31*
Neuroticism & Trait Anger	.71*	.61*	.57*
Agreeableness & Trait Anger	-.19	-.39*	-.43*

* $p < .05$

Table 2
Correlations Among Neuroticism, Agreeableness, and Buss-Perry Subscale Scores in Sample 3

	N	A	Ang.	P-Agg.	V-Agg.	Host.
N	-----					
A		-.31*				
Ang.			.75*			
P-Agg.			-.33*	.43*		
V-Agg.			-----	-.55*	.49*	
				.66*	-.50*	.64*
				-----	.69*	-.35*
					.77	.61*
					-----	.54*
						.58*

Note: N = Neuroticism; A = Agreeableness; Ang. = Buss Anger; P-Agg. = Buss Physical Aggression; V-Agg. = Buss Verbal Aggression; Host. = Buss Hostility.

* $p < .05$