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## Affective forecasting and the Big Five

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### ABSTRACT

Recent studies on affective forecasting clarify that the emotional reactions people anticipate often differ markedly from those they actually experience in response to affective stimuli and events. However, core personality differences in affective forecasting have received limited attention, despite their potential relevance to choice behavior. In the present study, 226 college undergraduates rated their anticipated and experienced reactions to the emotionally-evocative event of Valentine's Day and completed a measure of the Big Five personality traits – neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness – and their facet scales. Neuroticism and extraversion were associated with baseline mood, experienced emotional reactions, and anticipated emotional reactions. The present findings hold implications for the study of individual differences in affective forecasting, personality theory, and interventions research.

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### 1. Introduction

A number of philosophical theories and lay wisdom suggest that when making important life decisions, such as which job to take or which house to buy, people often seek to maximize well-being and positive emotional experiences and minimize enduring disappointment, regret, and other negative emotional states (Bentham, 1948; Bernoulli, 1954). Indeed, recent models of human decision making have shown that people often rely upon their anticipated emotional reactions as a guide to choice (Mellers, Schwarz, & Ritov, 1999). Personality traits have previously been found associated with both chronic mood states as well as real-time emotional reactions to evocative stimuli and events (e.g., Costa & McCrae, 1980). Might these traits relate similarly to anticipated emotions? Inquiry into personality differences in anticipated—rather than experienced—emotional reactions has received limited attention. Further, an emerging field of research examining the accuracy of anticipated emotional reactions, called *affective forecasting* (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998), highlights that anticipated and experienced emotional reactions are far from synonymous (for reviews, see Dunn & Laham, 2006; Hoerger, 2007; Wilson & Gilbert, 2003). In fact, some individual difference variables related to coping have shown different patterns of correlations with anticipated versus experienced emotional reactions (Hoerger, Quirk, Lucas, & Carr, 2009). The present investigation was designed to build upon past research findings linking neuro-

ticism and extraversion to experienced emotional reactions (Costa & McCrae, 1980; Larsen & Ketelaar, 1991; Rusting & Larsen, 1997; Tellegen, 1985) by also examining whether these traits demonstrate a similar pattern of correlations with anticipated emotional states.

Researchers have begun to examine factors influencing human decision making by testing mathematically models characterizing choice behavior (for a review, see Mellers et al., 1999). Among these models, *subjective expected pleasure theory* (Mellers et al., 1999) has carried favor in recent years due to rich theoretical development and robust empirical support (Kermer, Driver-Linn, Wilson, & Gilbert, 2006; Mellers, 2000; Mellers & McGraw, 2001; Mellers, Schwarz, Ho, & Ritov, 1997). In their work, Mellers and colleagues have distinguished *experienced emotions*, those felt in the here-and-now, from *anticipated emotions*, or those we expect to experience in response to future events. Their work shows that people regularly use their anticipated emotional reactions as a guide to choice. Individual difference variables have received little attention in these mathematical models.

Yet, a wealth of research indicates that personality is intricately linked to emotional experience. The Big Five model of personality has gained extensive support during the past half century and characterizes personality along the dimensions of neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness (for a review, see John & Srivastava, 1999). In this body of research, there is a well-documented association between neuroticism and negative affectivity; extraversion and positive affectivity (Costa & McCrae, 1980; Larsen & Ketelaar, 1991; Rusting & Larsen, 1997; Tellegen, 1985). However, the reason for these relationships

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is less straightforward than one might expect. As Larsen and Prizmic-Larsen (2006) p. 340, explain, emotional experiences are complex and can be characterized as “hybrid phenomena”, consisting of two components: (a) an emotional set-point or chronic mood state that is relatively stable over time, and (b) emotional reactivity to affective stimuli and events. At any given point in time, an individual’s emotional state is, thus, the byproduct of their chronic mood state and their acute emotional reactions to recent events. Is personality related to individual differences in chronic mood, emotional reactions, or both? A few studies have shown that neuroticism predicts both greater levels of chronic negative affect and increased negative reactivity to distressing stimuli, whereas extraversion is associated with better chronic mood and positive reactivity; effect sizes are typically in the small to modest range (Canli et al., 2001; Gross, Sutton, & Ketelaar, 1998; Lerner & Keltner, 2000; Zelenski & Larsen, 2001). These studies demonstrate a clear link between personality and emotional experience; however, it remains an open question whether the same trait differences extend to anticipated emotional reactions.

Recent research on affective forecasting, for example, has repeatedly shown that anticipated and experienced emotional reactions are remarkably discordant. In affective forecasting studies, participants may be asked to predict their emotional reactions to a future event or stimulus, and then report on their actual reactions to the event after it occurs. Studies have examined anticipated and experienced emotional reactions to a variety of events and stimuli, including election outcomes, football games, cash prizes, meals, housing assignments, tenure decisions, romantic breakups, final course grades, video clips, missed train departures, and holidays (for reviews, see Dunn & Laham, 2006; Hoerger, 2007; Wilson & Gilbert, 2003). These forecasting studies have shown that people are biased in making both random and systematic errors when anticipating their future emotional states. For example, the correlation between anticipated and experienced emotional reactions within the context of forecasting studies is typically quite small (Wilson & Gilbert, 2003). Further, various attentional biases (Sevdalis & Harvey, 2009; Wilson, Wheatley, Meyers, Gilbert, & Axsom, 2000) and the tendency to overlook future coping strategies (Gilbert et al., 1998; Hoerger, Quirk, Lucas, & Carr, in press; Hoerger et al., 2009) lead people to systematically overpredict the intensity and duration of emotional reactions to future events. Given this level of divergence between anticipated and experienced reactions, it is worth examining whether the link between personality and affectivity extends to anticipated emotional reactions.

Surprisingly few studies have simultaneously examined individual differences in both anticipated and experienced emotional reactions. Due to the barriers involved in conducting biphasic investigations of adequate power, forecasting researchers have often chosen to examine anticipated emotions only (e.g., Sevdalis & Harvey, 2009; Wilson et al., 2000, studies 4 and 5) or rely upon a between-group design, where different samples of participants were asked to rate either their anticipated or experienced reactions to an event (e.g., Fernandez-Duque & Landers, 2008; Wilson et al., 2000, studies 1 and 2). A recently conducted meta-analysis indicates that relatively few ( $n = 14$ ) of the 70+ affective forecasting studies have used a repeated-measures design, where the same set of participants provided both anticipated and experienced emotional reactions (Mathieu & Gosling, Personal communication, 2010). Aside from examining demographic differences, only two of these studies have examined how substantive individual difference variables relate to forecasting. In particular, Dunn, Brackett, Ashton-James, Schneiderman, and Salovey (2007) found that higher emotional intelligence was associated with greater accuracy in anticipating future emotional states. Additionally, Hoerger et al. (2009) found that effective coping styles were associated with

experienced—but not anticipated—emotional reactions, meaning that effective copers overestimated how long they would feel distressed after unpleasant events; these results have been replicated since the meta-analytic review was conducted (Hoerger et al., in press). Given the real-world importance of anticipated emotions (Mellers, 2000), the rapid expansion of personality research the last 30 years (John & Srivastava, 1999), and the recent upsurge in affective forecasting research the past decade (Dunn & Laham, 2006), it is somewhat surprising that no known study to date has simultaneously examined the relationship between personality and both anticipated and experienced emotional reactions. In the present investigation, we examined the association between the Big Five and anticipated and experienced reactions to an emotionally-evocative event, using a repeated-measures design. Extending upon personality studies of experienced emotional reactions, neuroticism was hypothesized to be associated with anticipated negative reactivity and extraversion with greater anticipated positive reactivity, with traits accounting for unique variance in anticipated emotions over and above that accounted for by experienced reactions.

## 2. Method

### 2.1. Overview

In affective forecasting studies, an important methodological consideration is the choice of an emotionally-evocative target event perceived as important and relevant to the sample. As such, researchers have often focused on general cultural events, such as holidays, key sporting events, or elections (Wilson & Gilbert, 2003). In the present investigation, we followed suit in examining affective forecasting for Valentine’s Day. This holiday was chosen because interpersonal events often evoke strong emotions (deCatanzaro, 1999), romantic concerns were expected to be of developmental salience among the young adults constituting our sample, and prior research indicates that Valentine’s Day is subjectively experienced as important and known to have a variety of considerable implications for romantic relationships (Morse & Neuberg, 2004).

### 2.2. Participants and procedures

In a within-subject design, participants rated their anticipated and experienced emotional reactions to Valentine’s Day of 2006. Past research and theory guided the time frame of the study. In particular, past researchers have identified that participants have a harder time anticipating their *enduring* emotional reactions to events—which are complicated by ambivalence, meaning-making strategies, and coping processes—than merely anticipating immediate emotional reactions (e.g., Finkenauer, Gallucci, van Dijk, & Pollmann, 2007; Wilson & Gilbert, 2003). For example, Gilbert et al. (1998) asked participants to predict (and later describe) how they would feel one month after an election, depending upon who was victorious. Hoerger et al. (2009) examined anticipated and experienced reactions to college football games, focusing on how participants were feeling 2 days after the game. Pilot data suggested that participants’ emotional reactions to Valentine’s Day would not fully subside for about 5 days, so in the present investigation, we chose to focus on participants’ anticipated and experienced emotional states approximately 2 days after Valentine’s Day had occurred.

In mid-January, participants ( $n = 251$ ) completed phase one by providing demographic information, completing personality measures, rating baseline mood, and anticipating how they would feel exactly 2 days after Valentine’s Day (February 16). Participants

rated how they anticipated feeling, both in the event of having a date and not having a date on Valentine's Day. Then on February 16, 90% of the original sample ( $n = 226$ ) rated how they were actually feeling. Consistent with IRB approval, all participants were recruited through the departmental subject pool and completed study measures online through SurveyMonkey.com.

Participants reported that they were predominantly young ( $M = 18.63$  years old,  $SD = 0.92$ ), female (72%), Caucasian (91%), and heterosexual (98%). Analyses were performed separately for those reporting having a date on Valentine's Day ( $n = 145$ , 64%) and those not having a date ( $n = 81$ , 36%). Participants generally knew whether to expect a date on Valentine's Day, as 82% of daters were in a relationship, and 78% of those dateless were single.

### 2.3. Measures

#### 2.3.1. Personality

To measure the Big Five personality traits, participants responded to items from the International Personality Item Pool (IPIP; Goldberg et al., 2006), using a 5-point Likert-type scale. Specifically, the IPIP was used to generate 30-item measures of neuroticism ( $\alpha = .89$ ), extraversion ( $\alpha = .82$ ), openness to experience ( $\alpha = .77$ ), agreeableness ( $\alpha = .83$ ), and conscientiousness ( $\alpha = .87$ ), with each scale then broken down into six separate facets, used for post hoc analyses.

#### 2.3.2. Emotion ratings

Pilot testing was used to identify six emotion words responsive to Valentine's Day: happy, fulfilled, proud, sad, lonely, and ashamed. Baseline mood was determined by having participants rate themselves on each of the six emotions at the start of phase one (mid-January). Anticipated emotion ratings were determined by having participants rate how they expected to feel 2 days after Valentine's Day, both in the event of having and not having a date on Valentine's Day. Experienced emotion ratings were determined by having participants rate their current emotional states during phase two (February 16). All emotion ratings were made using a 9-point Likert-type response scale. Each participant's baseline mood ( $\alpha = .73$ ), anticipated emotional state ( $\alpha = .77$ ), and experienced emotional state ( $\alpha = .78$ ) was computed from the average of the six emotion word ratings, with negative emotion words reverse-coded. Sometimes researchers desire to examine positive affect (PA) and negative affect (NA) separately; however, post hoc analyses revealed no statistically- or practically-significant differences in resulting effect sizes when PA or NA were considered separately, justifying use of the six-item scales.

Past researchers have emphasized that chronic mood states can confound emotional reaction ratings (Gross et al., 1998; Larsen & Prizmic-Larsen, 2006). Two methods for rectifying this problem have generally been suggested, involving simple difference scores or residualized change scores. Anticipated and experienced emotional reactions could be measured, for example, by subtracting baseline mood from the anticipated emotion ratings and from the experienced emotion ratings. Although this method can yield change scores that are easily interpretable, it was problematic in the present investigation because baseline mood correlated with change scores, a common shortcoming of the approach. Gross et al. (1998) indicated that under these circumstances residualized change scores should be used. Following their analytic approach, anticipated emotion ratings and experienced emotion ratings were regressed on baseline ratings, yielding residual scores indicative of anticipated reactivity and experienced reactivity. These residualized change scores were used in all correlational analyses.

## 3. Results

### 3.1. Erroneous forecasts

Prior research indicates that participants make systematic and random errors in attempting to anticipate future emotional states. Consistent with prior research (e.g., Hoerger et al., 2009; Wilson et al., 2000), participants systematically overestimated the intensity of future emotional reactions. In the present investigation, daters ( $M = 6.81$ ,  $SD = 1.21$ ) anticipated feeling more positive after Valentine's Day than non-daters ( $M = 4.84$ ,  $SD = 1.01$ ), which was a large effect,  $d = 1.83$ ,  $t(224) = 13.14$ ,  $p < .001$ . However, daters ( $M = 5.94$ ,  $SD = 1.18$ ) and non-daters ( $M = 5.76$ ,  $SD = 1.14$ ) did not differ in terms of their post-Valentine's Day emotional experience,  $d = 0.16$ ,  $t(224) = 1.13$ ,  $p = .26$ . Consistent with past research, participants in the current study generally overestimated the extent that Valentine's Day would influence their emotions, with daters modestly overestimating how positive they would feel (within-subject  $d = 0.67$ ) and non-daters strongly overestimating how negative they would feel (within-subject  $d = 0.84$ ).

The correlation between the residualized anticipated reactivity and experienced reactivity scores was examined to determine the level of random error in prediction. Among the total sample of participants, the correlation between anticipated and experienced emotional reactivity was marginal and non-significant,  $r = .08$ ,  $p = .25$ . For daters, the correlation was  $r = .15$ ,  $p = .19$ , and for non-daters the correlation was  $r = .05$ ,  $p = .56$ . Thus, participants demonstrated both random and systematic errors in forecasting their future emotional states. The discrepancy between anticipated and experienced emotional states allowed for the possibility that each could have unique personality correlates.

### 3.2. Big Five correlates

Rather than exploring all 30 facets, initial analyses were restricted to the core Big Five domains in order to avoid increasing the familywise error rate through excessive multiple comparisons. The traits of neuroticism, extraversion, openness, agreeableness, and conscientiousness were compared to baseline mood, anticipated emotional reactions, and experienced emotional reactions to Valentine's Day. Openness, agreeableness, and conscientiousness failed to demonstrate significant correlations. Table 1 shows that neuroticism and extraversion had significant correlations with emotion ratings, and post hoc comparisons were used to identify which facets were most relevant.

Extraversion was slightly associated with more pleasant baseline mood ( $r = .23$ ), anticipated emotional reactions ( $r = .19$ ), and experienced emotional reactions ( $r = .22$ ). This was particularly true for the facets of friendliness, gregariousness, and assertiveness. Cheerfulness was associated with baseline and experienced ratings, but not anticipated reactions. Findings for activity level and excitement seeking were more divergent, as they were unrelated to emotion ratings, aside from activity level being associated with lower baseline mood. When findings were examined separately for daters and non-daters, the pattern of correlations for extraversion was similar, though somewhat less powerful.

Neuroticism was slightly to modestly associated with greater negativity in baseline mood ( $r = -.33$ ), anticipated reactions ( $r = -.17$ ), and experienced reactions ( $r = -.28$ ). Among facets, depression and anxiety generally had the strongest correlations, though self-consciousness and immoderation demonstrated a similar pattern of results. For the anger facet, correlations were generally weaker, and for the vulnerability facet, there was no relationship with anticipated reactions. Results were tempered

**Table 1**

Neuroticism and extraversion correlate with anticipated and experienced reactions to Valentine's Day.

Trait	Non-daters <i>n</i> = 145			Daters <i>n</i> = 81			All participants <i>n</i> = 226		
	Baseline mood	Anticipated reaction	Experienced reaction	Baseline mood	Anticipated reaction	Experienced reaction	Baseline mood	Anticipated reaction	Experienced reaction
Neuroticism	-.26**	-.26**	-.24**	-.42**	-.08	-.34**	-.33**	-.17**	-.28**
Anxiety	-.23**	-.23**	-.15†	-.41**	-.06	-.33**	-.32**	-.16*	-.22**
Anger	.00	-.14†	-.10	-.16	.01	-.26*	-.06	-.06	-.16*
Depression	-.35**	-.28**	-.23**	-.55**	.03	-.25*	-.43**	-.20**	-.24**
Self-consciousness	-.19†	-.18**	-.25**	-.33**	-.11	-.22†	-.26**	-.16*	-.24**
Immoderation	-.15†	-.20*	-.11	-.10	-.06	-.18†	-.14*	-.14*	-.14*
Vulnerability	-.17*	-.07	-.18*	-.33**	-.11	-.29**	-.22**	-.01	-.22**
Extraversion	.19*	.12	.22**	.26*	.16	.22*	.23**	.19**	.22**
Friendliness	.22**	.17*	.22**	.18†	.17	.21†	.22**	.20**	.22**
Gregariousness	.14†	.11	.24**	.24*	.14	.26*	.18*	.12†	.18**
Assertiveness	.18*	.07	.11	.23*	.08	.22†	.22**	.16*	.15*
Activity level	-.20*	.03	-.05	-.14	.00	-.11	-.15*	.09	-.07
Excitement seeking	.02	.06	.09	.13	.10	.11	.07	.11†	.10
Cheerfulness	.34**	.05	.22**	.20†	.05	.25*	.27**	.02	.23**

Note: Anticipated reaction = predicted emotional state, controlling for baseline. Experienced reaction = post-Valentine's Day emotional state, controlling for baseline. Positive correlations indicate that traits are associated with more pleasant emotional states.

\* Statistically significant at the  $p = .05$  level.

\*\* Statistically significant at the  $p = .01$  level.

† Statistical trend at the  $p = .10$  level.

**Table 2**

Neuroticism and extraversion account for incremental variance in anticipated emotional reactions, over and above experienced reactions.

Model	$\Delta R^2$	$p$	$\beta$	$t$	$p$
Neuroticism model					
Step 1:	.01	.27			
Experienced reaction			.08	1.11	.27
Step 2:	.03	.02			
Experienced reaction			.03	0.41	.68
Neuroticism			-.17	-2.40	.02
Extraversion model					
Step 1:	.01	.27			
Experienced reaction			.08	1.11	.27
Step 2:	.03	.01			
Experienced reaction			.04	0.54	.59
Extraversion			.18	2.62	.01

Note:  $n = 226$ .

somewhat by subgroup, in that neuroticism was related to negative anticipated emotional reactions mainly among non-daters.

### 3.3. Unique contributions of traits

Finally, we used hierarchical multiple regression analyses to determine whether neuroticism and extraversion explained incremental variance in anticipated reactions, over and above that accounted for by experienced reactions (see Table 2). If traits were associated with anticipated reactivity solely because participants could accurately foresee their later emotional experiences, then traits would not account for incremental variance in anticipated reactivity. However, the results showed that neuroticism and extraversion each accounted for 3% of incremental variance in anticipated reactions. Thus, the contribution of neuroticism and extraversion to anticipated emotional reactions was unique and interesting, rather than merely a byproduct of participants being able to foresee trait variation in emotional reactions they would later experience in response to the event.

## 4. Discussion

The present investigation was designed to examine whether known personality differences in experienced emotions extended

to anticipated emotional reactions as well, particularly given the importance of anticipated emotions in shaping our existence and guiding decision making (Bentham, 1948; Bernoulli, 1954; Kermer et al., 2006; Mellers, 2000; Mellers & McGraw, 2001; Mellers et al., 1997). This investigation began by replicating past research documenting that neuroticism is associated with poorer baseline mood and negative reactivity to affective stimuli and events, whereas extraversion is associated with better mood and positive reactivity (Canli et al., 2001; Costa & McCrae, 1980; Gross et al., 1998; Larsen & Ketelaar, 1991; Lerner & Keltner, 2000; Rusting & Larsen, 1997; Tellegen, 1985; Zelenski & Larsen, 2001). The link neuroticism and extraversion share with positive and negative reactivity might have been expected to generalize to anticipated emotional reactions; however, recent research on affective forecasting has clarified that the emotional reactions people anticipate are often markedly different from those they later experience (Dunn et al., 2007; Gilbert et al., 1998; Sevdalis & Harvey, 2009; Wilson et al., 2000). As expected, participants in this study demonstrated erroneous affective forecasts, making both random and systematic errors. Although there is little published research on individual differences in affective forecasting, available evidence indicates that anticipated and experienced emotional reactions can have distinct correlates (Hoerger et al., 2009). Given the discordance between anticipated and experienced reactions in the current study, it was possible that these types of reactions might have had different personality correlates. However, parsimony prevailed. As hypothesized, neuroticism was generally associated with anticipated negative reactivity, and extraversion with anticipated positive reactivity; findings were relatively similar across personality facets. Further, these neuroticism and extraversion made independent contributions to anticipated reactions, over and above both baseline mood and experienced reactions. That is, personality was not merely associated with anticipated emotional reactions as an artifact of baseline mood differences or accurate anticipation of future emotional reactions.

The chief implication of this study is that individual differences have an important role to play in the field of affective forecasting research. Foremost, this line of inquiry can contribute to basic personality theory in suggesting possible avenues by which dispositional qualities impact behavior. For example, future investigators may be able to show that personality traits influence specific behaviors through some mediational role of anticipated

emotions, as subjective expected pleasure theory might suggest (Mellers, 2000; Mellers & McGraw, 2001; Mellers et al., 1997). Second, understanding individual differences in anticipated emotion has important implications for interventions research. Due to the important role of anticipated emotions in preparing for future healthcare needs (Sörensen & Pinquart, 2000), handling interpersonal conflict in the workplace (Dane & Pratt, 2007), and reasoning about political issues (Cassio & Lodge, 2007), interventions designed to modify behaviors may need to account for core personality differences in anticipated emotions.

Several limitations of this study can be noted and suggest future directions for further research. Foremost, additional evidence is needed to characterize the generalizability of the results, as observed effects were small to modest and tied to a university sample. Given age differences in personality (Weiss et al., 2005) and in forecasting (Nielsen, Knutson, & Carstensen, 2008), it would be worth examining whether the magnitude of personality differences in forecasting observed in this study are relatively consistent among older adults. Also, given the relevance of neuroticism and extraversion to psychological disorders, such as clinical depression, anxiety disorders, and personality disorders, an important step for future researchers would be to examine whether forecasting varies across syndromes. Additionally, situational moderators of personality differences in forecasting should also be examined, given that the current study was confined to one particular event, Valentine's Day. Candidate contextual variables include the emotional intensity of the event, the amount of social involvement, and the level of ambiguity or situational demand present (Quirk, Subramanian, & Hoerger, 2007). Studies jointly examining individual differences and contextual variables will allow for the exploration of person-situation interaction effects. Finally, in addition to moderator analyses, mediational studies are also needed, characterizing the ways in which personality influences anticipated emotions, and anticipated emotions subsequently impact choice behavior.

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