

## **INTERACTION AND INTERSECTION: THE CONSTELLATION OF EMOTIONAL STABILITY AND EXTRAVERSION IN PREDICTING PERFORMANCE**

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This study investigated the constellation of 2 Big 5 traits—Emotional Stability and Extraversion—in predicting job performance. Two forms of the constellation, one indirect (a statistical interaction) and the other direct (a measure of the intersection between the traits from the Big 5 circumplex), were used to predict job performance. Data were collected from employees and their supervisors at a regional health and fitness center. Results indicated that both measures predicted performance, even when controlling for the “main effects” of Emotional Stability and Extraversion, as well as 2 other relevant Big 5 traits (Agreeableness and Conscientiousness). These results suggest that the combination of Emotional Stability and Extraversion—reflecting a “happy” or “buoyant” personality—may be more important to performance than either trait in isolation.

In the past 15 years, the scientific currency of dispositional explanations of organizationally relevant behavior has undergone a radical transformation. Although 40 years ago Guion and Gottier (1965) expressed pessimism regarding the validity of personality measures in personnel selection decisions, in contemporary research this review is usually cited as an example of how far research has advanced. J. Hogan and Holland (2003) summarized, “Since 1990, meta-analytic reviews have shown that personality measures are useful predictors of job performance” (p. 100). Barrick and Mount (2005, p. 359) conclude, “Research, based on a construct-oriented approach primarily using the ‘Big Five’ traits, has consistently shown that personality predicts job performance across a wide variety of outcomes.”

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There are various reasons for this transformation in the literature, including the growth and application of meta-analysis, which has provided stronger and more consistent validity estimates of personality traits (Ones, Viswesvaran, & Dilchert, 2005); the acceptance and application of the five-factor model of personality, which has provided a useful organizing structure where little consensus previously existed (Barrick & Mount, 2005); and advances in personality research, which has provided a wealth of useful theoretical and methodological information (R. Hogan, 2005; J. Hogan & Holland, 2003).

Although dispositionalists can happily reflect on the gains realized in personality research and its application and study in industrial-organizational (I-O) psychology, at the same time, there is room for future theoretical and empirical development. For example, research has suggested that other traits, such as proactive personality (Crant, 1995) or core self-evaluations (Judge, Erez, Bono, & Thoresen, 2003), also predict job performance. Other research has investigated situational characteristics (e.g., Tett & Burnett, 2003), skills (Witt & Ferris, 2003), or other traits (Witt, Burke, Barrick, & Mount, 2002) as moderators of the validity of the Big Five traits in predicting performance.

It is on this latter point that we wish to focus our attention in this manuscript. Borrowing from the physical sciences, an interaction effect is defined as the dependence of an outcome on a combination of factors, such that the outcome is less predictable from the average effects of the factors taken separately (Futuyma, 1998). Following the tradition of behavioral research in the social sciences (Cozby, 2004), most research in psychology has conceptualized and assessed such interaction effects through multiplicative products. For example, the Witt et al. (2002) study assessed the interaction between Conscientiousness and Agreeableness by computing a variable that was a multiplicative product of the two traits. When conceptualized and analyzed properly, as in the case of the Witt et al. (2002) study, such interaction effects are interpreted in conditional terms so that the effect of one variable depends on or is conditioned by the other (Cohen & Cohen, 1983). Witt et al. (2002), for example, argued that the positive effect of Conscientiousness on job performance depends on, or is conditioned by, an employee's level of Agreeableness. Conscientiousness, they argued and found, may only translate into better performance when employees are interpersonally sensitive because conscientious, disagreeable employees may be seen as "micromanaging, unreasonably demanding, inflexible, curt, and generally difficult to deal with" (Witt et al., 2002, p. 165).

The Witt et al. (2002) study is noteworthy in that it is the first published study (of which we know) investigating interactions between two Big Five traits in predicting performance. Nevertheless, there are two specific areas for further development suggested by their study. First, as the authors

suggest, there are other trait–trait combinations that may be relevant—to job performance as well as to other criteria. Second, an interaction effect as defined above is not the only means of conceptualizing and measuring synergistic relationships among traits.

Specifically, another way of assessing trait combinations, and one that has been relatively unexplored in this line of research, is a circumplex model (Hofstee, de Raad, & Goldberg, 1992). The Big Five circumplex is a circular model of the personality domain in which each pair of the Big Five traits comprises its own circle. What makes the model circular is that when adjectives describing the pairs of traits are mapped onto two-dimensional space using their loadings as coordinates, they form a circle. Hence, the circumplex represents a step forward in the measurement of the personality domain, covering more conceptual territory than the Big Five factors in isolation (Johnson & Ostendorf, 1993). We believe that such a combination is particularly promising with respect to two Big Five traits: Emotional Stability and Extraversion.

Unlike Conscientiousness, the validity of which is generally consistent and robust (Barrick & Mount, 2005), Emotional Stability and Extraversion tend to have small, positive relationships with performance. Barrick, Mount, and Judge's (2001) integration of 15 meta-analyses revealed that the average validities of Emotional Stability and Extraversion were .13 (.09 uncorrected) and .10 (.08 uncorrected), respectively. These authors characterized these validities as "relatively low" (p. 22) and "somewhat disappointing" (p. 23). There may be various reasons why this is the case. The validity of these traits may depend on the situation. For example, Extraversion is a valid predictor of sales performance (Vinchur, Schippmann, Switzer, & Roth, 1998) but is negatively related to academic performance (Bratko, Chamorro-Premuzic, & Saks, 2006) and research productivity (Rushton, Murray, & Paunonen, 1987).

Another possible explanation is that an intersection between these two traits may have something unique to offer: It may capture the most important positive aspects of these traits as far as job performance is concerned. Lynn and Steel (2006) make this argument in terms of subjective well-being—that the unique combination of the traits is what counts. And, indeed, evidence suggests that the interaction of Emotional Stability and Extraversion predicts subjective well-being at the individual (Hotard, McFatter, McWhirter, & Stegall, 1989; Pavot, Diener, & Fujita, 1990) and national (Lynn & Steel, 2006) levels of analysis, such that it is the combination of higher levels of Emotional Stability and higher levels of Extraversion that produces the greatest happiness. To be clear, we are not arguing that validities of .13 and .10 are nil. Rather, our interest is on a particular explanation for how these validities might be improved. Nevertheless, our foregoing discussion suggests that the effect of the intersection of Emotional Stability and Extraversion—because it reflects a disposition

toward happiness—will be more strongly related to performance than the independent effects of these variables. For this reason, we expect the validities of Emotional Stability and Extraversion to correspond to the modest, but nonzero, validities of .13 and .10, respectively, as estimated by Barrick et al. (2001), and that both the statistical interaction and the circumplex measure will have higher levels of validity than the independent effects of these traits.

Accordingly, the purpose of this study is to investigate another trait by trait combination—Emotional Stability and Extraversion—with both indirect (statistical interaction) and direct (circumplex measure) approaches. In so doing, we hope to extend the predictor space by proposing another trait combination beyond that suggested by Witt et al. (2002), and also suggest another, perhaps more advantageous, measurement strategy for such trait-by-trait combinations. In the next section of the article, we introduce the Big Five circumplex and discuss its similarities to and differences from the more traditional statistical interaction between traits.

### *Big Five Circumplex*

The Big Five traits, though separable and distinct, are not fully independent; indeed, a circumplex structure can explain the overlap in the traits (Johnson & Ostendorf, 1993). Because the Big Five traits are not orthogonal (Ones et al., 2005), the five-factor model lacks simple structure, where items or scales have nonzero factor loadings on one and only one factor (Thurstone, 1947). As noted by Acton and Revelle (2004, p. 1), “Despite the commonplace application of simple structure, some psychological models are defined by a lack of simple structure.” Indeed, the Big Five traits “do not fit perfectly into simple-structure models” (Hofstee et al., 1992, p. 146). Of course, deviation from the simple structure is paid in the coin of added complexity—a fully circumplex structure of five traits amounts to 45 combinatorial measures (Goldberg, 1999). Hence, a circumplex structure, or a subtrait derived from the approach, must prove its worth by providing incremental validity beyond that produced by the simple structure. A distinctive feature of the circumplex structure is that it allows one to isolate a particular configuration that may be relevant, and an obvious question is how a circumplex measure relates to a statistical interaction between two traits, as in Witt et al. (2002). This is the issue to which we turn next.

### *Comparison of Circumplex and Statistical Trait $\times$ Trait Interaction*

A circumplex approach bears a great deal of similarity to a trait  $\times$  trait interaction, so much so that one might reasonably consider them alternative measures of the same concept. Specifically, both a circumplex measure

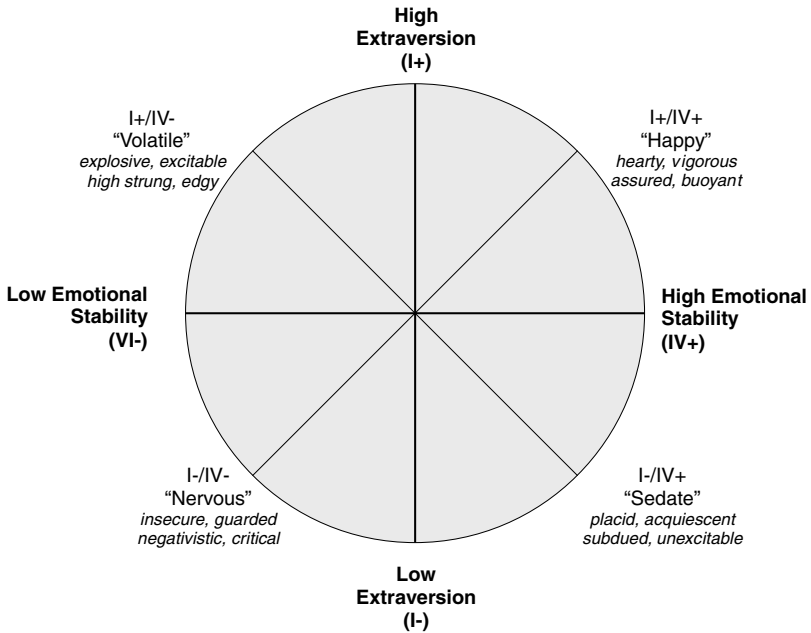


Figure 1: Circumplex Representation of Extraversion (Factor I) and Emotional Stability (Factor IV).

and a trait  $\times$  trait interaction each posit that a particular combination of traits produces additional predictive validity beyond that afforded by the independent effects of the two traits. Considering Emotional Stability and Extraversion, both approaches would posit, for example, that the synergistic combination of Emotional Stability and Extraversion will predict performance even taking the “main effects” of the two traits into account. Despite this similarity, there are also some differences that make these two alternative measures unique and somewhat distinct measures of the space between the two traits.

The most obvious difference between the approaches lies in their measurement. A statistical interaction is inherently indirect in that it is a mathematical combination of two variables. Of course, all personality measures are indirect in the sense that they measure latent (unobservable) variables, but an interaction is a further abstraction in that it is a conditional association between two variables. In contrast, a circumplex measure of the intersection between two traits is relatively more direct. In the most common formulation of the Big Five circumplex, there are four primary combinations, each representing high and low levels of the two traits. The Emotional Stability-Extraversion circumplex is shown in Figure 1.

(Consistent with prior circumplex research [Hofstee et al., 1992], we use Roman numerals to denote the Big Five factors: I = *Extraversion*, II = *Agreeableness*, III = *Conscientiousness*, IV = *Emotional Stability*, and V = *Openness*.) In the figure, the four primary combinations are (a) high emotional stability and high extraversion (IV+/I+); (b) low emotional stability and low extraversion (IV-/I-); (c) high emotional stability and low Extraversion (IV+/I-); and (d) low emotional stability and high extraversion (IV-/I+). Each one of these points could be directly assessed with measures that differ in their meaning and content. As one can see, in a circumplex model, the “low-low” combination is not merely a low level of the “high-high” combination (high scores on the “nervous” [I-/IV-] combination are not automatically produced by low scores on the “happy” [I+/IV+] combination). Rather, low scores on either the I+/IV+ dimension or the I-/IV- would move one toward the center of the circle, meaning that the dimension does not well characterize an individual. One would expect that adjacent points are more positively correlated than more distant points (e.g., I+/IV+ should correlate more positively with I+/IV- than with I-/IV-), but each point is conceptually and empirically distinct.

A second distinction between the circumplex and interaction is that, compared with an interaction, an intersection between two traits located along a circumplex is a more specific concept in that it stipulates a “unique geometric configuration” (Ansell & Pincus, 2004, p. 169). A circumplex measure has precise reference points that are fixed and, in the Big Five circumplex, each point represents a particular configuration of two traits, with “conceptual-empirical anchors” (Carson, 1996, p. 242). Each configuration is specific, different from other configurations, and can describe individuals. As Ansell and Pincus (2004, p. 170) note, in a circumplex measure, a “fixed radius is seen when traits are successfully projected to locations at equal distances from the center of the circumplex, and continuous form implies directionality of traits,” which differs from a statistical interaction. As noted by Goldberg (personal communication, February 20, 2006), “Strictly speaking, the use of any two dimensions in a linear fashion, as in a circumplex model, is not an ‘interaction,’ but is a combination of two variables.” A circumplex approach is based on trait combinations, where the traits are *fuzzy sets* or “classes without sharp boundaries in which there is a gradual but specifiable transition from membership to nonmembership” (Acton & Revelle, 2002, p. 447).

#### *Comparison of Big Five Circumplex to Affect Circumplex*

Compared with the Big Five circumplex, which can be characterized as in a relatively nascent stage, personality and organizational psychologists have much greater familiarity with the affect circumplex (Watson

& Tellegen, 1985). The affect circumplex posits two dimensions of affect, though there are disagreements about whether the most cogent dimensions are positive affect and negative affect (PA and NA; Watson, Wiese, Vaidya, & Tellegen, 1999), or pleasantness and activation (Russell & Barrett, 1999). If one utilizes the most common specification—that of PA and NA—then there is an obvious commonality with the Big Five traits of Extraversion and Neuroticism. Indeed, some researchers suggest that the concepts are interchangeable (Brief, 1998; Watson, 2000). The empirical literature is somewhat equivocal on this issue, nevertheless, finding that trait NA and Neuroticism appear more substitutable than trait PA and Extraversion (Thoresen, Kaplan, Barsky, Warren, & de Chermont, 2003).

Mindful of the empirical literature, we stop short of fully equating PA and NA with Extraversion and Neuroticism. Nevertheless, the affect circumplex may be of some use in elucidating the hypothesized performance implications of the intersection of high Emotional Stability and high Extraversion. In the affect circumplex, the labels for the PA+/NA– region—pleasantness (Watson et al., 1999) or pleasure (Russell, 1980)—do bear some similarity for the label for the I+/IV+ dimension (happy). Moreover, the markers of high PA and low NA—such as content, happy, kindly, pleased, satisfied, warmhearted—are similar or identical to the markers of the I+/IV+ region (assured, hearty, happy). Indeed, as revealed by the graphical representation of the IV+/I+ circumplex in Figure 1, a happy personality (Goldberg, 1999) is one interpretation of the intersection. We should also note that this interpretation of the combination of high Emotional Stability and high Extraversion—as representing happiness—is not confined to the circumplex. Those who have investigated the statistical interaction between the two traits also interpret it in the same manner. As we will note shortly, the happiest people may be defined not simply by the additive effects of Emotional Stability and Extraversion but by the interactive combination of these two traits (Lynn & Steel, 2006).

#### *Hypothesized Validity of Emotional Stability–Extraversion Intersection*

Having argued that a happy disposition may reflect the intersection between high Emotional Stability and high Extraversion, there are two issues to consider here. First, is there reason to believe that happy people are better performers? Second, if happy people are indeed better performers, why might that be the case? We deal with each question in turn.

An emerging body of research—most of it conducted by Wright, Cropanzano, Staw, and colleagues—suggests that measures of happiness or well-being are positively related to job performance (Staw, Sutton, & Pelled, 1994; Wright & Cropanzano, 2000; Wright, Cropanzano, & Meyer, 2004; Wright & Staw, 1999). Although our focus here is on a happy

personality rather than happiness as a state, state and trait measures often converge (Watson, 2000), suggesting that the aforementioned research, direct tests notwithstanding, might generalize to “happy personalities.”

Having established that those who score high on Emotional Stability and Extraversion might be characterized as having a happy personality, and given that happiness is linked to job performance, the next logical question is why such a relationship might exist—why is it that happy workers seem to be more productive? We discuss three reasons. First, happy people tend to frequently experience positive affect (Diener, Suh, Lucas, & Smith, 1999), and a growing body of research shows that people in positive mood think better (Isen, 2000), make better decisions (Estrada, Isen, & Young, 1997, Staw & Barsade, 1993), are more creative (Isen, Daubman, & Nowiciki, 1987), are more motivated (Erez & Isen, 2002), and in general perform better on a variety of tasks (Isen, 1999). Individuals in a positive mood also tend to be more cooperative (Carnevale & Isen, 1986) and helpful (Isen & Levin, 1972). These behaviors—decision making, creativity, motivation, cooperation, prosocial behaviors—should generate higher levels of performance in most jobs and occupations.

Second, in reviewing the happiness literature, Lyubomirsky, King, and Diener (2005) concluded, “Most respondents like happy people much more than they like their less-than-happy peers” (p. 827). Veenhoven (1988) notes that individuals find happy people as more appealing interaction partners. Given the importance of liking to performance ratings (Lefkowitz, 2000), if happy employees are more likeable, then they should receive higher performance ratings both directly (where supervisory affect toward an employee may spill over unto their ratings; Lefkowitz, 2000) and indirectly (employees who are likeable in the eyes of customers and coworkers may capitalize on this goodwill in ways that contribute to their performance).

Third, happy people participate in more activities. Lyubomirsky et al. (2005) state, “The data suggest that happy people participate in more activities than their less happy peers” (p. 827). Activity level is a harbinger of high performance (Erez & Judge, 2001)—those who approach their work with vigor, initiative, and energy are likely to be better performers in most any occupational pursuit. Not only may the activity level of happy individuals give them an edge, the *type* of activity may matter. Specifically, happy employees also may be better performers because they tend to socialize and find social connections productive. DeNeve and Cooper’s (1998) comprehensive meta-analysis revealed that of all the personological correlates of happiness, the strongest was affiliation. This is not a new finding. Forty years ago, in his review of the subjective well-being literature, Wilson (1967) concluded, “Perhaps the most impressive single finding lies in the relation between happiness and successful involvement



with people” (p. 304). More recently, Lyubomirsky et al. (2005) conclude, “Both the cross-sectional evidence and the longitudinal evidence we have reviewed thus far strongly suggest that happy people are better able to develop social relationships and build a rich network of support” (p. 833). Given the social nature of work, those establishing positive and productive social relationships should be greatly advantaged. As Morgeson, Reider, and Campion (2005) recently noted, because work is often organized around teams, “skills, knowledge, and motivation needed to function effectively in a team go well beyond the core technical skills often measured in traditional selection contexts” (p. 584). The combination of Emotional Stability and Extraversion should be one of those nontraditional skills that is well suited to the social world of work.

In sum, given that the intersection between Emotional Stability and Extraversion can be interpreted as representing a happy personality—whether as assessed with a statistical interaction (Pavot et al., 1990) or the IV+/I+ area of the circumplex (Goldberg, 1999)—there is ample reason to believe that this personality attribute will be positively related to performance. Therefore,

*Hypothesis 1:* Both an indirect and a direct measure of the intersection of Emotional Stability (ES) and Extraversion (E) will significantly predict job performance. For the indirect measure, the statistical interaction (ES × E) will predict performance such that the effect of one trait (e.g., Extraversion) will be stronger the higher level of the other (e.g., Emotional Stability; Hypothesis 1a). For the direct measure, a measure of the circumplex intersection of high Emotional Stability and high Extraversion (IV+/I+) will positively predict performance (Hypothesis 1b).

#### *Relevance of Conscientiousness and Agreeableness*

Although not explicitly hypothesized, we also control for two other Big Five traits in the analyses—Conscientiousness and Agreeableness. Conscientiousness is related to job performance across jobs (Barrick et al., 2001). Accordingly, we include Conscientiousness as a control variable in the study. Although Agreeableness does not correlate as strongly with performance as does Conscientiousness (Barrick et al., 2001), it has been linked to job performance involving interpersonal interactions (Mount, Barrick, & Stewart, 1998) and to customer service measures (Ones & Viswesvaran, 2001). Therefore, we also include Agreeableness as a control variable. Finally, because Witt et al. (2002) found a significant interaction between

Conscientiousness and Agreeableness, we also investigated whether this interaction was significant in our study and whether controlling for it affected the hypothesized results.

### *Method*

#### *Setting, Participants, and Procedure*

Participants were employees of a large regional health and fitness center located in a medium-size city in the southeastern United States. The health and fitness center has roughly 5,000 members and 200 full-time employees (180 of which had been employed at the organization long enough to obtain a performance evaluation). Employees work in various customer service positions, including service staff (floor instructors, receptionists, “kids’ club” attendants), membership sales, personal training, and group fitness (yoga, tai chi, kick boxing, etc.). We should note that although not all the positions are on the “front line,” the organization does consider all employees to be service providers. For example, the job description for sales team members indicates that they serve as a “fitness counselor to our members and guests.” Moreover, in the customer service literature, the increasingly close linkage between sales and customer service is often noted (e.g., Chang, 2006).

Employees were invited to participate in the study, and participation was completely voluntary. The study was approved by the university’s Institutional Review Board. Participants completed the personality survey during work time. After employees had completed the survey, supervisors evaluated the performance of all employees. Of a pool of 180 eligible employees, 131 completed usable surveys, representing a response rate of 73%. Supervisors completed evaluations of 167 of eligible employees, representing a response rate of 93%. A comparison of respondents and non respondents indicated that employees who did not complete the survey were no different in their level of performance from those who did complete the survey. Listwise deletion resulted in a final sample size of 122 observations.

#### *Measures*

*Big Five traits.* The Big Five traits of Emotional Stability, Extraversion, Conscientiousness, and Agreeableness were measured with the Big Five Inventory (BFI; John, Donahue, & Kentle, 1991; John & Srivastava, 1999). The BFI items are short sentences (e.g., “I am full of energy”), developed so that the measure is brief and clear, while also avoiding some of the pitfalls of other measures (ambiguous or multiple meanings and social

desirability; John & Srivastava, 1999). Although the BFI is relatively brief, it has a substantial amount of construct validity evidence in its favor (Donnellan, Oswald, Baird, & Lucas, 2006; Gosling, Rentfrow, & Swann, 2003; John & Srivastava, 1999; Mehl, Gosling, & Pennebaker, 2006; Reynolds & Clark, 2001), and uses of the BFI have appeared in the best journals in both personality (e.g., DeYoung, 2006) and industrial-organizational (Jackson, Colquitt, Wesson, & Zapata-Phelan, 2006; Judge, LePine, & Rich, 2006) psychology.

In the BFI, the Extraversion scale consists of eight items (e.g., "I am talkative," "I am full of energy"). The Emotional Stability (labeled by its opposite pole—Neuroticism—by the authors) scale also consists of eight items (e.g., "I get nervous easily" [reverse scored], "I am emotionally stable, not easily upset"). The Conscientiousness scale consists of nine items (e.g., "I do things efficiently," "I tend to be disorganized" [reverse scored]). The Agreeableness scale consists of nine items (e.g., "I like to cooperate with others," "I tend to find fault with others" [reverse scored]). Responses to each item were anchored by a 5-point scale ranging from 1 = *strongly disagree* to 5 = *strongly agree*. Scales for each measure were computed by averaging participants' responses for the items. Coefficient alpha reliability estimates of the scales were as follows: Extraversion,  $\alpha = .70$ ; Emotional Stability,  $\alpha = .83$ ; Conscientiousness,  $\alpha = .77$ ; Agreeableness,  $\alpha = .71$ .

*Emotional stability–Extraversion intersection.* The circumplex intersection between Emotional Stability and Extraversion (IV+/I+) was measured with the AB5C (Hofstee et al., 1992) scale contained in Goldberg's (1999) International Personality Item Pool (IPIP, 2001). Sample items from the IV+/I+ AB5C scale include: "Seldom feel blue," "Feel comfortable with myself," "Look at the bright side of life," "Am sure of my ground," "Have a lot of fun" and "Am filled with doubts about things" (reverse scored). Individuals responded to the 10 items using a 1 = *very inaccurate* to 5 = *very accurate* response scale; total scores were computed by averaging the responses across the 10 items. Goldberg reports  $\alpha = .84$  for the scale. In this study,  $\alpha = .87$ .

*Emotional stability–Extraversion interaction.* To test the statistical interaction between Emotional Stability and Extraversion (ES  $\times$  E) in predicting job performance, we computed the interaction by multiplying the measures of Emotional Stability and Extraversion, after first centering the scores at their means (Aiken & West, 1991).

*Job performance.* Supervisors evaluated employees' job performance using a 7-item behaviorally anchored rating scale. Because the organization did not have a multidimensional performance appraisal measure in use at the commencement of the study, the measure was developed using the following process. First, the authors interviewed several members

of the management, inquiring about the nature of the jobs and work in the organization, the organization's culture, and its selection process. Management then provided the authors with a description of the jobs within the organization, as well as the selection instruments that were currently in use. Third, based on the literature of measures of service and overall job performance (Lapierre, 1996; Parasuraman, Berry, & Zeithaml, 1991; Welbourne, Johnson, & Erez, 1998), and the information obtained in the first two steps, the authors drafted a set of performance dimensions. These dimensions were then shared with management and were further refined. Fourth, behaviorally anchored scales for each dimension were then developed, using the literature on behaviorally anchored rating scales (Bernardin & Smith, 1981), and interviews of three top managers in the organization who provided incidents of excellent, average, or poor performance for each dimension. Finally, the dimensions and anchors were shared with the management, and slight adjustments were made.

The seven items were intended to cover the primary areas of employees' performance, and consisted of motivation, innovation, problem solving, leadership, cooperative and positive interactions in dealing with customers and employees, stress tolerance, and overall job performance. Supervisors rated employees' performance on a 1–7 scale, where high (6–7), moderate (3–5), and low (1–2) performance levels were delineated. Supervisors were assured that the performance evaluation survey was confidential. Because individuals had multiple supervisors, we were able to have each employee's performance evaluated by two supervisors. Performance scores were computed by averaging the raters' responses to each item and then averaging the two raters' average responses.

There are several ways to estimate the reliability of this measure. First, one can determine whether the items are internally consistent. For both supervisors, the 7-item scales were internally consistent: supervisor 1,  $\alpha = .93$ ; supervisor 2,  $\alpha = .94$ . Second, and perhaps more fundamentally, one can determine whether the raters agree in their evaluations (interrater reliability). In such a case, the intra class correlation is the best means of assessing inter rater reliability (ICC; Shrout & Fleiss, 1979). In the present study, the inter rater reliability estimates were ICC-1 = .51, which assesses the reliability for a single rater, and ICC-2 = .68, which assesses the interrater reliability of the average rating. These levels of reliability closely resemble meta-analytic estimates of the reliability of supervisory ratings of job performance (Viswesvaran, Ones, & Schmidt, 1996).

### *Results*

Means, standard deviations, and intercorrelations among the study variables are provided in Table 1. As has been found in past research

TABLE 1  
*Means (M), Standard Deviations (SD), and Intercorrelations  
 Among Study Variables*

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7
1. Emotional Stability (ES)	2.54	0.66	(.83)						
2. Extraversion (E)	3.74	0.73	.32**	(.70)					
3. Conscientiousness	3.93	0.51	.27**	.18*	(.77)				
4. Agreeableness	3.85	0.48	.42**	.31**	.25**	(.71)			
5. IV+/I+	3.76	0.65	.67**	.30**	.20*	.30**	(.87)		
6. ES × E	-0.16	0.58	.01	.29**	.12	.08	.04	—	
7. Job performance	5.23	0.91	.13	.10	.29**	.09	.29**	.23**	(.94)

*Notes.* IV+/I+ = AB5C measure of high Emotional Stability and high Extraversion. Coefficient alpha ( $\alpha$ ) reliability estimates are on the diagonal.

\* $p < .05$  (two-tailed). \*\* $p < .01$  (two-tailed).  $N = 122$ .

(Ones, Viswesvaran, & Reiss, 1996), Emotional Stability and Extraversion are moderately correlated ( $\hat{r} = .32, p < .01$ ). The statistical interaction is unrelated to Emotional Stability ( $\hat{r} = .01, ns$ ) and not strongly related to Extraversion ( $\hat{r} = .29, p < .01$ ), which is to be expected given that centering dramatically reduces the correlation of an interaction with its components (Aiken & West, 1991). For the same reason, the statistical interaction is virtually unrelated to the circumplex IV+/I+ intersection ( $\hat{r} = .04, ns$ ). Emotional Stability and Extraversion have positive, but modest, correlations with job performance ( $\hat{r} = .13$  and  $\hat{r} = .10$ , respectively), which are very close to the uncorrected correlations reported by Barrick et al. (2001). A somewhat anomalous result in Table 1 is that although the circumplex measure correlates more highly with Emotional Stability than Extraversion, the reverse is true for the statistical interaction. Because both of the measures, in concept, should sample equally from each trait, these results are difficult to explain, though the label of the I+/IV+ intersection—happiness—might seem conceptually more similar to Emotional Stability than to Extraversion. Finally, both forms of the Emotional Stability–Extraversion constellation (IV+/I+ and the computed interaction [ES × E]) are significantly related to job performance ( $\hat{r} = .29$  and  $\hat{r} = .23$ , respectively, both  $p < .01$ ).

To determine the relationship of the statistical interaction of Emotional Stability and Extraversion (ES × E) to job performance, we conducted a hierarchical moderated regression analysis (Aiken & West, 1991), where on the first step of the equation only the “main effects” (Emotional Stability and Extraversion) plus Conscientiousness and Agreeableness are entered into the regression predicting job performance. In a second regression,

TABLE 2  
*Interaction of Emotional Stability and Extraversion in Predicting  
 Job Performance*

	Before entry of interaction		After entry of interaction	
	$\hat{\beta}$	$SE_{\hat{\beta}}$	$\hat{\beta}$	$SE_{\hat{\beta}}$
Emotional Stability (ES)	.04	.10	.03	.10
Extraversion	.04	.10	.09	.10
Conscientiousness	.27**	.09	.24**	.09
Agreeableness	-.02	.10	.00	.10
Emotional Stability $\times$ Extraversion (ES $\times$ E)	—	—	.21*	.09
R	.30**	.09	.36**	.09
R <sup>2</sup>	.09**	—	.13**	—
$\Delta R^2$ (ES $\times$ E)	—	—	.05*	—

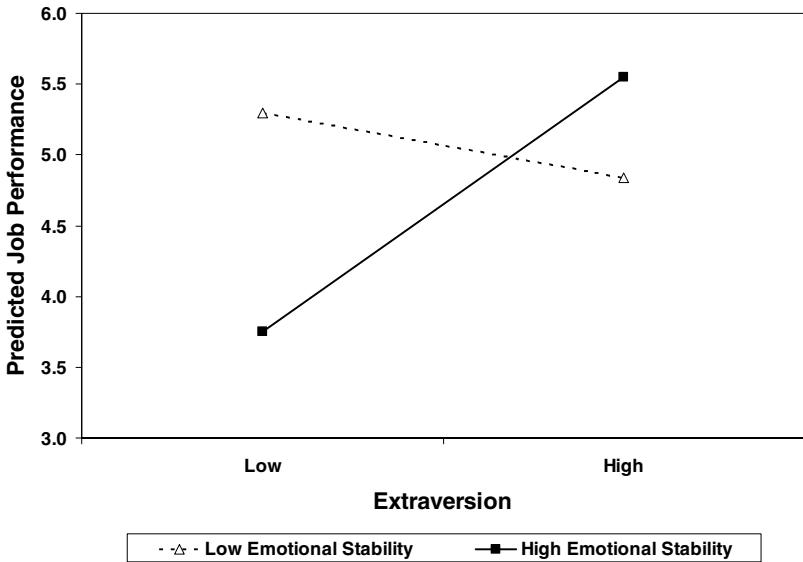
Notes.  $\hat{\beta}$  = Standardized regression coefficient.  $SE_{\hat{\beta}}$  = Standard error of standardized regression coefficient.  $\Delta R^2$  = unique variance explained by interaction when entered on last step.

\* $p < .05$  (two-tailed). \*\* $p < .01$  (two-tailed).  $N = 122$ .

these same variables are entered, along with the ES  $\times$  E interaction. Results of this analysis are provided in Table 2. As the table shows, neither Emotional Stability nor Extraversion had significant main effects on performance. Nevertheless, the ES  $\times$  E interaction did significantly predict performance ( $\hat{\beta} = .21, p < .05$ ). Therefore, Hypothesis 1a is supported by the results. The interaction explained significant ( $\Delta R^2 = 5\%, p < .05$ ) incremental variance in performance controlling for the other Big Five traits. Conscientiousness also significantly predicted performance ( $\hat{\beta} = .24, p < .01$ ).

A graph of the interaction is shown in Figure 2. The figure shows that for individuals low (more than one standard deviation below the mean) on Emotional Stability (high on Neuroticism), Extraversion was slightly negatively related to job performance. Nevertheless, for individuals high (more than one standard deviation above the mean) on Emotional Stability (low on Neuroticism), Extraversion was positively related to job performance.

Results for the circumplex Emotional Stability–Extraversion intersection (IV+/I+) are provided in Table 3. As before, Conscientiousness significantly predicted job performance ( $\hat{\beta} = .27, p < .01$ ), whereas neither Emotional Stability nor Extraversion significantly predicted performance. The circumplex IV+/I+ measure did significantly predict performance ( $\hat{\beta} = .25, p < .05$ ), even controlling for Emotional Stability and Extraversion. When added on the last step of the regression, the circumplex IV+/I+



**Figure 2: Interaction Between Emotional Stability and Extraversion in Predicting Job Performance.**

measure explained a significant amount of incremental variance in job performance ( $\Delta R^2 = 6\%$ ,  $p < .05$ ). Therefore, Hypothesis 1b was supported by the results.

To test the relative incremental variance explained by the main effects of Emotional Stability and Extraversion compared with either the indirect or direct measure of the intersection of these traits, we entered Emotional Stability and Extraversion as a block, predicting performance (controlling only for Conscientiousness and Agreeableness) and compared these results with the incremental variance estimates provided in Tables 2 and 3. When Emotional Stability and Extraversion were entered as a set, they explained a small and nonsignificant ( $\Delta R^2 = .004\%$ , *ns*) amount of incremental variance in performance. This is much smaller than the incremental variance explained by the statistical interaction ( $\Delta R^2 = 5\%$ ) and the circumplex measure ( $\Delta R^2 = 6\%$ ).

Although we have not reported results including the other Big Five trait—openness to experience—in any of these analyses, including a measure of Openness ( $\alpha = .82$ ) did not change any of these results and as expected, Openness itself had very small, nonsignificant effects on performance. This makes sense as, of the Big Five traits, Openness bears the weakest relationship to performance (Barrick et al., 2001).

TABLE 3  
*Circumplex Measure of Emotional Stability and Extraversion  
 (IV+I+) in Predicting Job Performance*

	$\hat{\beta}$	$SE_{\hat{\beta}}$
Emotional Stability	.03	.13
Extraversion	-.03	.10
Conscientiousness	.27**	.09
Agreeableness	-.01	.10
Emotional Stability – Extraversion (IV+I+)	.25*	.12
<i>R</i>	.38**	.09
<i>R</i> <sup>2</sup>	.15**	—
$\Delta R^2$ (IV+I+)	.06*	—

*Notes.*  $\hat{\beta}$  = Standardized regression coefficient.  $SE_{\hat{\beta}}$  = Standard error of standardized regression coefficient.  $\Delta R^2$  = unique variance explained by IV+I+ when entered on last step.

\* $p < .05$  (two-tailed). \*\* $p < .01$  (two-tailed).  $N = 122$ .

### *Additional Analyses*

In investigating the robustness of the results, and to further explicate their meaning, we undertook two additional analyses. The results of these analyses are reported below.

*Inclusion of both interaction and circumplex intersection.* Given the modest correlation between the statistical interaction and the direct circumplex measure (not unexpected because the components of the interaction were centered prior to computation), we also estimated the effect of the variables simultaneously. When both measures were added to the regression simultaneously, both terms remained significant. The coefficient for the circumplex IV+I+ measure was  $\hat{\beta} = .26, p < .05$ . The coefficient for the statistical interaction was  $\hat{\beta} = .19, p < .05$ . These are nearly identical to the individual results reported in Tables 2 and 3.

*Conscientiousness  $\times$  Agreeableness interaction.* Though not reported in the tables, we also tested a Conscientiousness  $\times$  Agreeableness (C  $\times$  A) interaction (Witt et al., 2002). For the analyses in Table 2 with the ES  $\times$  E interaction measure, the C  $\times$  A interaction was not quite significant, though it was in the right direction ( $\hat{\beta} = -.14, p = .11$ ). Including the C  $\times$  A interaction did not change the ES  $\times$  E coefficient estimate in Table 2 ( $\hat{\beta} = .21, p < .01$ , as before). Likewise, for the analyses of the direct IV+I+ measure (Table 3), the C  $\times$  A interaction was not significant ( $\hat{\beta} = -.09, p = .31$ ), and its inclusion changed very little the coefficient on the IV+I+ measure ( $\hat{\beta} = .24, p < .05$ ).



*Discussion*

In reviewing the literature on personality and performance, Barrick et al. (2001, p. 23) concluded, "A great deal of progress has been made in the last 50 years in understanding personality and performance linkages. The use of the FFM framework coupled with meta-analysis has been especially instrumental in enabling the field to move forward." Nevertheless, these authors were also careful to note that not all has been learned about the dispositional basis of job performance, and explicitly called for research that investigated lower-order or more specific traits. As Ten Berge and De Raad (1999) noted, one way forward—to extend what is known beyond the Big Five factors—is to utilize a circumplex approach, which may be well suited to tap the conditional nature of specific criteria.

In an effort to advance Big Five research without eschewing its contributions, our approach in this study was to link a Big Five trait constellation to performance in a specific context. John and Srivastava (1999) argued that a challenge for five-factor model research "is to spell out, with much more precision, those characteristics that fall in the fuzzy regions between the factors" (p. 106). Despite its ability to illuminate these "fuzzy regions," surprisingly few studies have used the Big Five circumplex in research, and those studies that have used the circumplex tend to be measurement oriented (e.g., de Raad & Hofstee, 1993). There have been repeated calls for further study of interactions among the Big Five with respect to the Big Five circumplex (John & Srivastava, 1999) and as applied to I-O psychology in particular (Barrick & Mount, 2005). Our study was an effort to respond to each of these calls.

The results of this study show, in two conceptually related but distinct ways, that the highest performance was due to the constellation of Emotional Stability and Extraversion. If the results of this study are to be trusted, significant validity gains can be realized through considering the intersection of Emotional Stability and Extraversion. Given that this intersection appears to represent the disposition to be happy, these results suggest that people who are buoyant, cheerful, effervescent, and enthusiastic are likely to be better performers.

We should note that in no case were the "main effects" of Emotional Stability or Extraversion significant, meaning that the independent effects of the two variables were not significant. At first blush, this may seem inconsistent with previous research. Nevertheless, the zero-order (uncorrected) correlations reported here are nearly identical to Barrick et al. (2001)—for Emotional Stability .13 in Table 1 versus .09 in Barrick et al., and for Extraversion, .10 in Table 1 versus .08 in Barrick et al. It is true that the standardized regression coefficients in Tables 2 and 3 are much weaker than this, but if one performs a regression on the meta-analytic

estimates from Barrick et al. (2001), the results are quite similar ( $\beta = .04$  for Emotional Stability and  $\beta = .07$  for Extraversion) to those in Tables 2 and 3.

In reflecting on the results, one may wonder about how the statistical interaction and circumplex measure can coexist. Although, as we note shortly, there may be reasons to prefer the latter measure over the former, it is also important to keep in mind that each assessment can be distinct and useful. Alternative measures of the same construct can each explain incremental variance in a criterion. For example, Mount, Barrick, and Strauss (1994) found that both self- and observer reports of personality can each predict performance, even when controlling for each measure. As Mount et al. (1994) note, "These results underscore the distinction between the validity of personality constructs per se and the validity of the constructs based on a particular method of measurement" (p. 277). Both the statistical interaction and the circumplex measure assess the intersection between Emotional Stability and Extraversion. That both measures predict performance increases one's confidence that the intersection of these two traits is valid in predicting performance, but this also suggests that the measures are unique.

Although of course they are different in their measurement, the results produced by the interaction and the circumplex are relatively similar. In reflecting on the interaction results in Figure 2, the highest performers were those who scored high on both Emotional Stability and Extraversion. Because this corresponds most closely to the circumplex point of I+/IV+, the two sets of results are quite consistent on that front. On the other hand, the results in Figure 2 also show that the poorest performers are those who score low on Extraversion but *high* on Emotional Stability. Although we can only speculate on these results, it may be that, in the context of our study (service providers in a health and fitness center), although the best performers are high on both traits, it is worse to be sedate and unexcitable than nervous or even volatile.

Returning to the area of consistency, both the interaction and the circumplex affirm the importance of having high levels of both traits. The circumplex intersection measure clearly shows that people who are similar to the prototypical "happy person" are better performers. That is, the more individuals are representative of the happy personality (DeNeve & Cooper, 1998)—of high Emotional Stability and high Extraversion—the higher they are rated by their supervisors. In contrast, as respondents gradually transit in the circumplex from membership to nonmembership in the "happy person" category (Figure 1), they also transit away from the "good performer" category. The interaction likewise suggests that the combination of Emotional Stability and Extraversion is important, but in a somewhat different way. According to Figure 2, the interaction effect suggests

that the benefits of being extraverted are realized only for emotionally stable individuals. Therefore, although the circumplex intersection indicates that “having more” of both traits makes better performers, the interaction suggests this in a conditional sense—that being more extraverted is better the higher the emotional stability of the individual. Although the interpretation is somewhat different, practically, the general implication may be the same—that employers need to seek the “happy-type” employee, not necessarily the emotionally stable employee or extraverted employee in isolation.

### *Limitations and Strengths*

This study has several limitations that are important to discuss. First, we realize our data were collected in a single organization. Therefore, replication of these results is essential. Second, it would have been useful to investigate validities by job type, but we did not have access to that information and, obviously, testing the interaction by job subgroups would have posed statistical power problems. Nevertheless, investigation of whether the Emotional Stability–Extraversion intersection holds across job types is important to extend the generalizability of the results and may shed further light onto the nature of the intersection. Finally, our measure of performance, though advantageous from the standpoint of being evaluated by multiple supervisors, was nontraditional in the sense that quality and quantity of work were not assessed. Although the organization under study made a good case that these traditional concepts do not do a good job of characterizing the jobs in their organization, it is possible that the performance dimensions we did measure (e.g., motivation, innovation, problem solving, leadership, cooperative, and positive interactions in dealing with customers and employees, stress tolerance, and overall job performance) increase the possibility that our results capitalize on situation specificity.

The weaknesses of this study are accompanied by several strengths. Although measurement problems have plagued personality research (Hough & Oswald, 2005), we extended Big Five measures without compromising their validity. As Ones et al. (2005) note, personality is hierarchically organized, and one way to organize the Big Five traits is with a circumplex model. Therefore, one can deal with the criticism that the Big Five are too broad to capture nuances in personality (Mount & Barrick, 1995) by adding theoretically relevant circumplex traits. In short, as noted by Ten Berge and De Raad (1999), the very generality that makes the Big Five useful in predicting a whole host of criteria also means that, owing to that generality, there is room for more specific traits and trait combinations that may be more precisely mapped onto situations.

### *Implications and Future Research*

Given that both the statistical interaction and the circumplex measure predicted performance (even when included in the same equation), one might wonder which measure is to be preferred. The circumplex measure did have slightly higher validity, but, as important, in a personnel selection context, it is more easily included and used in a selection system. Specifically, the circumplex measure can be used and interpreted as any other standard personality measure. The interaction, nevertheless, would require that an organization first assess applicants' Emotional Stability and Extraversion, multiply those scores, and then (in a top-down selection system) select those with the highest scores. Although this is certainly possible, the logic of this prediction is not easily explained to managers, which would require an understanding of the intricacies of moderated regression (if they are to understand *why* the interaction must be computed). We are not recommending against use of the interaction, but because it is more difficult to implement practically, and because we are not aware of any personality-based selection systems that compute and use explicit interaction terms, we are less confident in its practicality than the circumplex measure.

Beyond those already mentioned, there are other areas for future research suggested by these findings. Given the success observed here, future research should test other circumplex structures in predicting other criteria. An example from the negotiation literature may be illustrative. Barry and Friedman (1998) found that although the Big Five traits (notably, both Extraversion and Agreeableness were liabilities) predicted success in distributive bargaining, the Big Five traits were poorly correlated with success in integrative bargaining ( $|\bar{r}| = .07$ ). It seems possible that circumplex intersections of the traits might prove a fruitful avenue for future research. For example, the intersection of high Extraversion and Openness to Experience is characterized by "perceptive" and "industrious," whereas the intersection of high Emotional Stability and Openness to Experience is characterized by "innovative" "astute," and "versatile" (Hofstee et al., 1992). It seems possible that such a circumplex application to negotiation, and to many other I-O criteria, would prove fruitful.

### *Conclusion*

Results of this study suggested that, at least in terms of predicting performance in service-oriented work, the validity of the five-factor model can be extended by the inclusion of the Emotional Stability and Extraversion constellation. Although, considered individually, Emotional Stability

and Extraversion are not unrelated to performance (Barrick et al., 2001), the results presented here suggest the importance of the synergistic combination of the two traits. To paraphrase Einstein and Infeld (1938) in their description of Scottish physicist James Maxwell's work on electromagnetism (where he analyzed the joint behavior of electric and magnetic fields): For work performance, it is not the Emotional Stability of the employee, nor her Extraversion, but the space in between the two that matters.

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