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# The higher-order factors of the Big Five as predictors of job performance

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## ABSTRACT

Despite the fact that the relationship between the Big Five personality traits and job performance has been widely investigated, no study has focused on the criterion validity of Stability and Plasticity, the two higher-order factors of personality. The current research aims to fill this gap in the literature by relying on a hierarchical model that includes both the Big Five and their higher-order factors. Two studies were conducted among incumbents working for an insurance company (n = 101) and security agents (n = 201). Stability (but not Plasticity) accounted for variance in job performance beyond that accounted for by measures of the Big Five. © 2012 Elsevier Ltd. All rights reserved.

The affirmation of the Big Five model (i.e. Extraversion/Energy, Agreeableness, Conscientiousness, Emotional stability and Openness/Intellect) as one of the most influential description of personality structure (Goldberg, 1993) has bolstered the interest of practitioners and researchers in the field of Industrial and Organizational Psychology for personality assessment (but see Block, 1995 for a different perspective). The understanding of how personality is related to Job Performance (JP) is important for personnel selection and theories linking individuals' characteristics to organizational behavior. Considerable meta-analytical evidence has suggested that JP is associated with conscientiousness and, to a lesser extent, with emotional stability across different occupational groups (Barrick, Mount, & Judge, 2001; Salgado, 1997). Empirical findings supported the incremental validity of these traits over measures of general mental ability (GMA) (Dunn, Mount, Barrick, & Ones, 1995). The traits of extraversion and agreeableness have also been shown to be predictive of IP, although only for specific occupations or performance criteria (Barrick et al., 2001; Salgado, 1997). The Big Five (BF), however, may not represent the highest level of generality at which the association between personality and JP can fruitfully be examined. In the present study, we examined the role of personality in predicting JP using a hierarchical model that incorporates the BF and their higher-order factors.

Although the BF were initially conceived as orthogonal traits (Costa & McCrae, 1995; Goldberg, 1993), factor analysis has demonstrated that two higher-order factors, or metatraits, exist above the BF (DeYoung, 2006; DeYoung, Peterson, & Higgins, 2002; Digman, 1997). These factors were labelled as *Stability* (or Alpha), which reflects the shared variance of Emotional stability, Agreeableness and Conscientiousness, and *Plasticity* (or Beta), which reflects the shared variance of Extraversion and Openness. Both

these factors have been shown to have a genetic basis (Jang et al., 2006; McCrae et al., 2008). Stability appears to reflect stable functioning in emotional, motivational, and social domains, whereas Plasticity appears to reflect the tendency to explore the environment, both behaviorally and cognitively.

The relations between JP and personality can be conceived in terms of the metatraits for several reasons. First, the fact that Agreeableness, Conscientiousness, and Emotional stability are associated with JP may suggest a role for Stability. In this regard, Ones, Viswesvaran, and Schmidt (2003), argued that "the conglomeration of these three personality constructs [i.e. conscientiousness, agreeableness, and emotional stability corresponds to Digman (1997) factor alpha [Stability] (i.e., the socialization second-order factor of personality—a higher-order factor than the Big Five) and is particularly relevant in the prediction of behaviors at work (p. 23)". They also speculated that: "scoring high on this higher-order personality trait would predict a whole spectrum of work behaviors, from avoiding drug and alcohol use, to engaging in appropriate customer service behaviors from dealing with stress well to not stealing, from avoiding absenteeism to actually being a stellar overall performer on the job" (Ones & Viswesvaran, 2001, p. 37). It is difficult to advance similar arguments for Plasticity. Whereas extraversion has proved to be a relevant predictor of IP only for specific occupational groups, for example for those which require leadership or teamwork abilities (Barrick et al., 2001), openness has shown inconsistent or even negative correlations with JP. At the best, it seems arguable that Plasticity will be related to JP only for jobs which require agentic qualities.

A different argument for expecting that Plasticity and Stability would be related to JP is that measures of JP are general in nature (Hogan & Roberts, 1996; Ones & Viswesvaran, 1996). According to the correspondence principle (Fishbein & Ajzen, 1975), the generality of typical JP criteria (e.g. overall or average performance) calls for similarly broad trait measures (Ones & Viswesvaran, 1996; Ones, Viswesvaran, & Schmidt, 1993). Since organizational criteria are often

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broad and complex (Ones & Viswesvaran, 1996), one may expect that broad personality traits should have higher criterion validity than specific and narrow traits. Obviously this does not negate the possibility that, to a certain extent, IP can be related also to the single BF. A relationship between JP and a first-order component (for example conscientiousness) is indeed conceivable also in the presence of a significant influence of the respective higher-order dimension (Stability). This relation would represent the influence of the unique part of conscientiousness that is not explained by Stability (i.e. that is not shared with the other first-order components). On the other hand, the variance shared by the metatraits components may play a role in the prediction of JP, over and above the specific variance of each BF. Furthermore, one should not underestimate results from other studies (Ashton, 1998; Schneider, Hough, & Dunnette, 1996) which have highlighted the risk that complex predictors may dilute important variance in more specific facets. Empirical findings are still lacking in this regard. To the best of our knowledge, no study has examined the link of Stability and Plasticity with JP, as well as their incremental validity over and above the BF traits.

In this contribution, we present two studies aimed to investigate the competitive value of Stability and Plasticity with respect to the BF in the prediction of IP. In both studies Stability and Plasticity were used to predict objective performance, which is the type of criteria on which personnel decisions are based (Robie & Ryan, 1999). In the first study, the incremental value of the metatraits over the BF was tested in a sample of sales representatives. In the second study we tried to replicate our results using a sample of security guards. Arguably, the personality profile required to achieve success in these two jobs are quite different. For example, social abilities and extraversion (associated with Plasticity), may be important for a social profession such as being a salesman, but less important, or not important at all for a security guard. Since both jobs require workers to be responsible, scrupulous, emotionally stable, and, to a certain extent, agreeable, one may expect that Stability would predict JP in both samples. The link between Plasticity and IP, instead, could emerge for salesmen only (study 1), for which personality characteristics like extraversion, social competence, and interpersonal effectiveness may also be desirable.

# 1. Study 1

From a psychometric perspective, Stability and Plasticity represent two multidimensional constructs (Edwards, 2001), as they refer to several distinct but related dimensions (i.e. different combinations of the BF) treated as assessing two distinctive, higher-order, theoretical concepts (Law, Wong, & Mobley, 1998). The validity of multidimensional constructs should be submitted to the same empirical tests as standard psychological constructs (Edwards, 2001; MacKenzie, 2003). Accordingly, in this study we empirically tested the relations of the BF and their higher-order factors with JP using two models. In the Big Five Model (BFM), five latent traits were modeled as latent variables predicting JP. In the Stability-Plasticity model (SPM), two higher-order factors were modeled. The first (Stability) loaded by conscientiousness, emotional stability, and agreeableness, and the second (Plasticity) loaded by energy and openness. We evaluated the predictive value of both models, using the criteria to compare correlated construct models (i.e. the BFM) with multidimensional construct models (i.e. SPM) proposed by Edwards (2001).

## 2. Method

#### 2.1. Participants and procedures

Participants were one hundred and one sales representatives, working for a national insurance company. The mean age of

participants was 39.81 (SD = 7.3). Data on the BF were collected in January 2007, during specific testing sessions organized by a local section of the company, located in Rome. All participants were advised through informed consent that performance evaluations would not be affected by their decision to participate. Performance data were gathered from the human resources department at the end of the same year.

#### 2.2. Measures

#### 2.2.1. Big Five

Personality traits were measured through a short version of the Big Five Questionnaire (BFQ, Caprara, Barbaranelli, & Borgogni, 1996). The BFQ contains 60 items that form five domain scales (Extraversion/energy, Agreeableness, Conscientiousness, Emotional stability, and Openness), and 10 "facet" scales, with six items on each scale. The response scale of the items varied from 1 (very false for me) to 5 (very true for me). Cronbach's alpha coefficients ranged from .73 (Extraversion/energy) to .88 (Emotional stability).

## 2.2.2. Job performance

Individuals' performance evaluations were obtained from the human resources department records. These data were supplied by the organization, and are part of the standard evaluation process. They consisted of a composite index comprising both objective data (i.e., number of sales) and supervisors' subjective evaluations, as prescribed by the company's performance appraisal procedure. This index ranged from 1 (low performance) to 3 (high performance).

# 2.3. Statistical analyses

The hypothesized models were tested by means of Mplus 4.01 (Muthén and Muthén, 1998–2008). We used WLSMV as the method of estimation, which is particularly suited for dealing with nonnormal or categorical data (Flora & Curran, 2004). It provides weighted least square parameter estimates which rely on a diagonal weight matrix with robust standard errors and mean and variance adjusted chi-square test statistics (see Muthén and Muthén, 1998–2008). All models were evaluated following current standards (Kline, 2008; Muthén and Muthén, 1998–2008): CFI and TLI > .95, RMSEA < .06, and WRMR < 1.00.

# 2.4. Modeling strategies

We tested two models. In the BFM the five traits are posited as latent variables loaded by the respective facets. The BF were allowed to correlate. In the SPM we added Stability and Plasticity as second-order factors. The chi-square difference test was used to compare the fit of these two nested models. If the more parsimonious SPM demonstrated a fit equal to that of the BFM, we evaluated: (a) the contribution of Stability and Plasticity to JP, and (b) the incremental contribution of each single BF, over and above their higher-order factors. To this aim, we used a structural equation model where the specific effects, stemming from each of the BF, were conceptualized as the paths linking JP to the disturbances of the first-order personality factors (see Bentler, 1990).

# 3. Results and discussion

# 3.1. Descriptive statistics

Correlations, means, and standard deviations for the ten facets of the BFQ are presented in Table 1. Both facets of Conscientiousness and Agreeableness were highly correlated with JP. Significant relations also emerged for the facets of Emotion Control and Openness to Culture. Facets belonging to the same domain were strongly correlated amongst themselves. On average, the mean performance was evaluated as moderately low.

#### 3.2. The Big Five Model (BFM)

In this model, IP was posited as an observed variable which was allowed to correlate with each of the BF. According to current criteria (Kline, 2008), this model fitted the data adequately:  $\chi^2(N = 101)$ ; df = 39) = 66.40, p < .01, CFI = .91, RMSEA = .071, WRMR = .069. Uniquenesses of openness to culture and emotion control were allowed to correlate because this was suggested by modification indices. This residual correlation is consistent with previous studies that have shown that Emotional stability and Openness typically show correlated residuals in single-informant models (DeYoung, 2006; DeYoung et al., 2002). Each facet significantly and strongly loaded on its intended factor (M = .79; SD = .04). The BF were found to be moderately correlated among themselves (the average r was.28, SD = .17). IP was significantly correlated with Conscientiousness (r = .44, p < .01), Agreeableness (r = .42, p < .01) and Emotional stability (r = .36, p < .01). When JP was regressed on the five traits, only Conscientiousness remained significant ( $\beta$  = .34, p < .01). This model accounted for a significant proportion of variance in IP ( $R^2 = .33$ , p < .05).

## 3.3. The Stability-Plasticity Model (SPM)

Following Edwards (2001), we compared the BFM with the SPM, in which the two higher- order factors of Stability and Plasticity were introduced as predictors of IP (Fig. 1). To identify this model, we restricted the loadings of Extraversion/energy and Openness on Beta to be equal. The model fit was adequate,  $\chi^2(N = 101)$ ; df = 47) = 74.53, p < .01, CFI = .91, RMSEA = .076, WRMR = .083. The SPM fits as well as the BFM,  $(\Delta \chi^2(8) = 8.14, p = .42)$ . Stability was found to be a significant predictor of JP. When Stability and Plasticity were included as predictors instead of the BF, the variance accounted for by the model increased to 38%. Stability and Plasticity were moderately correlated with each other. To investigate residual relations from the BF to JP we examined the modification indices (MI) of these parameters that in the posited model were fixed to zero. To control for Type I error, the nominal p value of .05 was divided by the number of MI's examined (i.e. 5), yielding a critical p value of.005, which corresponds to a chi-square of about 6.6. None of the MI's exceeded this value.

#### 4. Study 2

This study aimed to replicate findings from study 1, using a different sample and a different multifaceted measure of JP, rated by three supervisors. In light of the compounded nature of security agents' work, each supervisor has a unique, yet potentially valid, perspective on workers' performance. Moreover, the use of multiple informants would increase the reliability of the performance criterion (Oh & Berry, 2009).

## 5. Method

#### 5.1. Participants and procedures

Participants included in this study were 201 male security agents working for a national security company. They were recruited during a longitudinal study aimed to investigate the individual predictors of JP. The mean age of participants was 38.65 (*SD* = 9.89). Data were collected during specific testing sessions organized by a local section of the company, located in Rome. These sessions were offered as a free opportunity to each employee. All participants were advised through informed consent that performance evaluations would not be affected by their decision to participate. Performance data were gathered from the human resources department at the end of the year. This interval of time was deemed appropriate, given our focus on the predictive value of individual differences, which conceptually implies temporal separation between predictors and outcomes.

#### 5.2. Measures

# 5.2.1. Big Five

Personality traits were measured through a short version of the BFQ-2 (Caprara, Barbaranelli, Borgogni, & Vecchione, 2007). This form contains 60 items that form five domain scales and 10 "facet" scales, with twelve items on each scale. The response scale of the items varied from 1 (very false for me) to 5 (very true for me). The short form included the items with the best psychometric properties from the BFQ-2. Cronbach's alpha coefficients ranged from .73 (Extraversion/energy) to .88 (Emotional stability).

# 5.2.2. Job performance

In light of the compounded nature of surveillance jobs, this company adopts a 360' performance evaluation system that relies on three direct supervisors that are well acquainted with workers. Each supervisor holds a unique, yet potentially valid, perspective on individuals' behavior at work. Employees' performance was

**Table 1**Means, standard deviations, internal consistency and intercorrelations among variables (Study 1).

		-												
	M	SD	1	2	3	4	5	6	7	8	9	10	11	
Job performance	.56	.45	_											
Openness to culture	3.76	.63	.28**	.61										
Openness to experiences	3.96	.53	04	.53**	.70									
Scrupulousness	3.67	.54	.44**	.00	.00	.65								
Perseverance	3.63	.63	.20*	05	03	.54**	.61							
Dynamism	3.59	.39	.05	.27**	.48**	.04	.18	.60						
Dominance	3.47	.37	.16	.16	.22*	.02	.24**	.64**	.67					
Cooperativeness	4.07	.54	.29**	.13	.21*	.27**	.24**	.20*	.31**	.73				
Politeness	3.95	.62	.36**	.09	.16	.26**	.15	.22*	.36**	.62**	.61			
Emotion control	2.82	.52	.40**	.18	.04	.22*	.08	.01	.03	.37**	.16	.72		
Impulse control	2.57	.51	.16	.11	.12	.14	.02	.00	.08	.28**	.15	.67**	.78	

Note. N varies from 97 to 101 due to missing data. Reliabilities (Cronbach's alpha) appear on the diagonal (where appropriate).

<sup>\*</sup> p < .05.

<sup>\*\*</sup> p < .01.

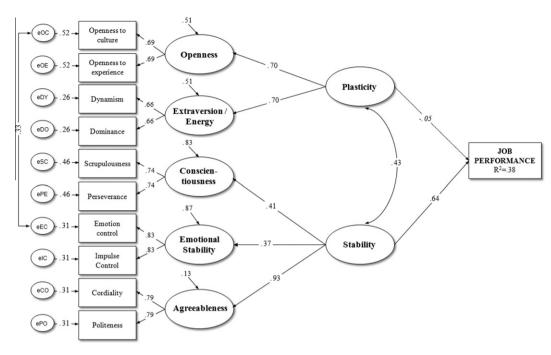


Fig. 1. Structural parameters of the Stability-Plasticity Model (Study 1). Solid lines indicate significant parameters (p < .05).

rated through the company's performance appraisal tool. This instrument comprised seven performance aspects, namely "discipline" (e.g. "meets the norms of the workplace"), "work quantity" (e.g. "completes work on schedule"), "work quality" (e.g. "perform his/her accountabilities with skill and knowledge"), "problem solving" (e.g., "identifies problems and finds appropriate solutions"), "teamwork" (e.g. "willing to work harmoniously with others"), "cooperation" (e.g. "responds positively to instructions and procedures"), and "commitment to safety" (e.g. "performs work in safe manner and adheres to safety rules"). Ratings were made on a 5point scale ranging from 1 (does not meet expectations) to 5 (outstanding). The degree of agreement among the three supervisors, was evaluated with the intraclass correlation coefficient (ICC) and found moderately high (mean ICC ranged from .80 to .89). Thus, each indicator was averaged across the three informants. A Principal Factor Analysis (PFA) conducted separately for each supervisor supported a two-factor structure explaining the 57% of the total variance. The first factor was loaded by four indicators (i.e. "discipline", "work quantity", "work quality", "problem solving"), whereas the second factor was loaded by three indicators (i.e. "teamwork", "cooperation", "commitment to safety"). Based on the composition of the factors, and in accordance with literature (Van Scotter & Motowidlo, 1996), the first factor was named jobdedication (alphas based on the three supervisor ratings were respectively.79, .84, and .79), whereas the second factor was named task-performance (Alphas were .82, 81, and .79).

#### 6. Results and discussion

#### 6.1. Descriptive statistics

Correlations, means, and standard deviations of the ten facets of the BFQ-2 and the seven performance criteria are presented in Table 2. Both facets of Conscientiousness were significantly correlated with all performance criteria, except with the "work quality". Among the facets of Extraversion/energy, Dynamism was significantly correlated with "Teamwork", "commitment to safety", "Discipline", and "Problem solving", whereas "Dominance"

was significantly correlated with all criteria, except "Ability to manage work activities". Moderate correlations were observed between both facets of Agreeableness and Emotional stability and some indicators of JP.

# 6.2. The Big Five Model (BFM)

We specified the same measurement model as in Study 1, with two additional factors of job dedication and task performance, that were allowed to correlate among themselves and with all the BF. Full maximum likelihood estimation supported an adequate fit:  $\chi^2(N = 201; df = 108) = 204.49, p < .01, CFI = .93, RMSEA = .067,$ SRMR = .048. Each facet significantly and strongly loaded on its intended factor (M = .75; SD = .05). Factor loadings for job dedication (M = .79; DS = .04) and task performance (M = .82; DS = .03) factors were high and significant. The BF were moderately correlated among themselves (the average r was .37, SD = .15), as well as the two dimensions of IP (r = .61, p < .01). Job dedication was significantly related to Conscientiousness (r = .41, p < .01) and Extraversion/energy (r = .27, p < .01), whereas task performance was significantly related to Conscientiousness (r = .42, p < .01), Emotional stability (r = .36, p < .01), Extraversion/energy (r = .34, p < .01), and Agreeableness (r = .27, p < .01).

When the two JP factors were regressed on the five traits, Conscientiousness ( $\beta$  = .29, p < .01) and Extraversion/energy ( $\beta$  = .19, p < .01) significantly predicted job dedication. Conscientiousness ( $\beta$  = .35, p < .01) and Extraversion/energy ( $\beta$  = .33, p < .01) also significantly predicted task performance. This model accounted for a significant proportion of variance in both job dedication ( $R^2$  = .10, p < .05) and task performance ( $R^2$  = .21, P < .05).

# 6.3. The Stability-Plasticity Model (SPM)

The fit of the SPM was adequate,  $\chi^2(N=201; df=119)=223.51$ , p < .01, CFI = .93, RMSEA = .066, SRMR = .058. This model fits equally as well as the less restricted BFM ( $\Delta \chi^2(11) = 19.02$ , p = .06). As can be observed (Fig. 2), Stability was a significant predictor of both job dedication and task performance above and beyond the BF. The contribution of Plasticity, instead, was not significant. This model

**Table 2**Means, standard deviations, internal consistencies and intercorrelations among variables (Study 2).

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Openness to culture	2.56	.78	.82																
Openness to experiences	3.55	.56	.54*	.58															
Scrupulousness	3.78	.61	.30°	.26*	.64														
Perseverance	2.09	.58	.27*	.25*	.50*	.63													
Dynamism	3.48	.53	.27*	.40*	.22*	.16*	.60												
Dominance	3.33	.56	.34*	.38*	.26*	.22*	.52*	.65											
Cooperativeness	3.95	.85	.27*	.23*	.32*	.34*	.24*	.24*	.78										
Politeness	4.08	.58	.22*	.13	.28*	.32*	.28*	.22*	.67*	.65									
Emotion control	2.42	.70	.27*	.26*	.39*	.32*	.16*	.29*	.25*	.33*	.82								
Impulse control	2.60	.80	.24*	.18*	.36*	.37*	.04	.25*	.21*	.26*	.65*	.74							
Problem Solving	3.17	.64	.14*	.01	.22*	.22*	.14*	.20*	.19*	.13	.21*	.21*	.88						
Cooperation	3.20	.73	.12	.05	.28*	.23*	.09	.20*	.15*	.19*	.25*	.25*	.64*	.85					
Teamwork	3.12	.72	.18*	.09	.21*	.25*	.21*	.21*	.21*	.20*	.25*	.22*	.54*	.68*	.82				
Commitment to safety	3.15	.78	.20°	.02	.24*	.23*	.25*	.23*	.13	.20*	.25*	.21*	.62*	.60*	.70°	.80			
Work quantity	2.90	.67	.00	.07	.25*	.27*	.09	.13	.03	.04	.06	.07	.33*	.28*	.70	.39*	.85		
Discipline	2.97	.65	.23*	.01	.26*	.22*	.20*	.26*	.15*	.20°	.07	.05	.42*	.43*	.38	.50*	.69*	.85	
Work quality	2.98	.62	.11	.12	.23*	.13	.07	.18*	.08	.01	.04	.08	.35*	.32*	.52	.42*	.69*	.64*	.89

Note. N varies from 191 to 201 due to missing data. On the main diagonal are shown reliabilities (Cronbach's alpha) for the Big Five facets, and ICC's for the aggregate indicators of JP.

accounted for 11% of the variance in job dedication and 23% of the variance in task performance. Stability and Plasticity were moderately correlated. All of the MI's related to the links between the residual variance of each BF to the two performance factors lay below the critical value of 7.85 (p = .005).

#### 7. General discussion

Across two studies, we analytically investigated the prediction of JP using the BF, and their metatraits. Among the BF, Conscientiousness showed the highest correlations with the different JP criteria. These correlations were moderately high (mean r = .42) and slightly higher than those reported in previous meta-analyses (e.g. Barrick et al., 2001). This was not unexpected, as we modeled each personality trait as a latent variable, thus controlling for the effect of measurement error, which typically affects the summative mean scores commonly used in the empirical studies on which the

meta-analyses are based. Furthermore, there is increasing evidence that the use of 360 degree performance ratings (as in Study 2), may produce stronger relationships between the FFM of personality and IP (Oh & Berry, 2009).

Across two different samples of workers, Stability, but not Plasticity, predicted JP significantly. As we anticipated, this factor was loaded by the traits that were more consistently associated to JP in most of earlier research. In this regard, it is important to underline that (1) the SPM fits the data well, at least as well as the BFM, and (2) Stability predicted JP, above and beyond the BF. This result might be due to the fact that in the SPM the BF are weighted according to their correlations. This reduces multicollinearity while increasing their predictive accuracy. Whereas our data suggest the opportunity to consider more general dispositions than the BF, further studies are needed to scrutinize "if and when", differently from the present case, specific effects, stemming for example from Conscientiousness to JP, may prove to exist over and above the effect of the metatraits. These effects might reveal

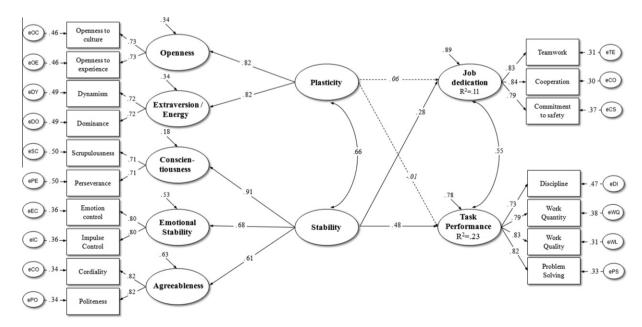


Fig. 2. Structural parameters of the Stability-Plasticity Model (Study 2). Solid lines indicate significant parameters (p < .05).

p < .05.

the importance that the proportion of trait variance specific to a single BF (i.e. not shared with the metatraits) has in predicting JP. All told, as (1) only Stability predicted JP, (2) the added proportion of explained variance was low, and (3) to create the SPM one should measure all the BF anyway, the use of the simple BFM is still recommended in the interests of parsimony.

From a theoretical point of view, present results acquire relevance also in light of the recent debate concerning the usefulness and the role of Stability and Plasticity within the BF theory of personality, as they expand their predictive value in organizational settings. What seems to be needed at this point is the development of a comprehensive framework, able to link metatraits, BF, and their facets to performance across a wide range of jobs. For practitioners, the novelty here is the availability of more general indices of "work adjustment" to consider, along with standard measures of the BF, during human resources selection. This seems particularly useful, as the use of personality inventories in organizational settings seems to be growing and personality has become one of the most active areas of research in personnel psychology.

## Acknowledgements

We acknowledge the limitations of the present study. Data are cross-sectional, so that the reported associations cannot confirm causality. While we have reasons to believe that the main causal process goes from basic traits to work performance, we are aware of possible reciprocal influences. For example the similarity-attraction framework may suggest that people are self-selected into jobs that emphasize certain traits. Notwithstanding these limits, present results contribute significantly to the recent debate concerning the usefulness and the role of Stability and Plasticity within the BF theory of personality. Future studies should ascertain if the significance of the relation between Plasticity and JP may change depending on the nature of the job. In the meanwhile, our data offer preliminary evidence of the usefulness of Stability as a predictor of IP.

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