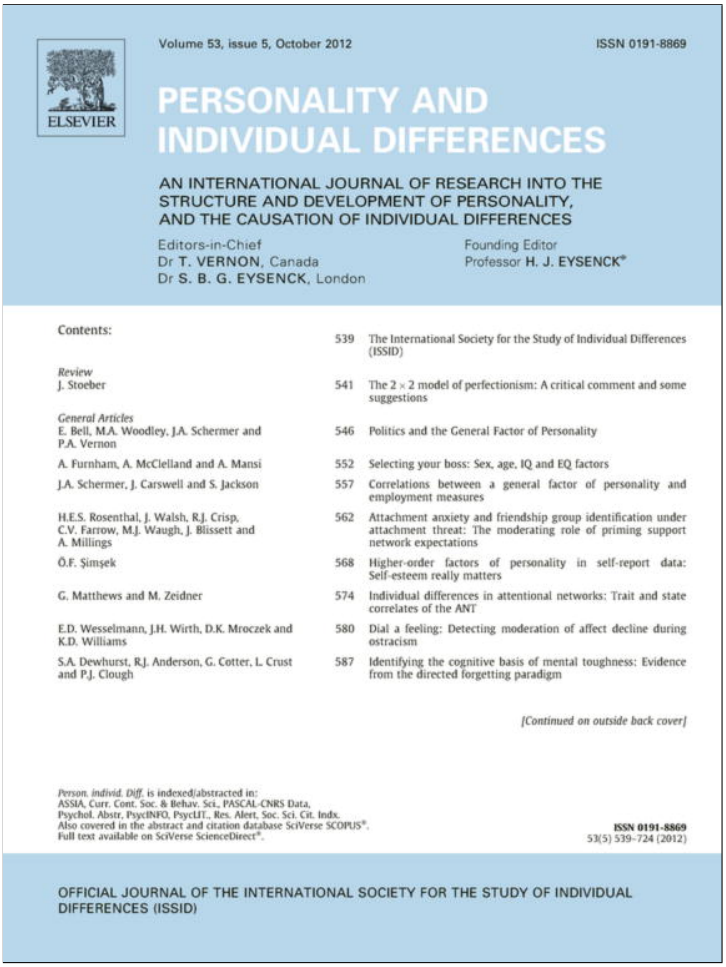

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Higher-order factors of personality in self-report data: Self-esteem really matters

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ABSTRACT

The aim of this study was to test three alternative models of personality structure, the first-order model, the general factor model and the Big Two model, using 44-item Big Five Inventory in a large sample ($N = 878$). The first-order, the general factor, and the Big Two models of personality were tested using a type of confirmatory factor analysis. In all analyses, both common method variance and self-esteem were defined as method variables. The results, contrary to the earlier findings, showed that self-esteem was important in understanding higher-order organization of personality, and the data indicated greater support for the Big Two model than the general factor of personality. The results were discussed in the light of the literature, and future directions were considered.

1. Introduction

The Big Five personality factors were considered the most parsimonious structure of personality trait organization until meta-trait(s) were proposed by researchers, due to correlations among the factors. Some researchers proposed the Big Two could account for the correlations among personality factors (DeYoung, 2006; Digman, 1997), while others supported the concept of general factor of personality (GFP – Musek, 2007). Another group of researchers, however, set out to explain the covariances among the factors in terms of different, previously unconsidered, aspects. One of these, self-esteem, has received attention in recent years. However, this line of research suffered from serious shortcomings, such as poor statistical methodology and/or limited sample size. This research aims at illuminating the effects of self-esteem on the accounts of metatraits using a large sample. Self-esteem, as well as common method variance (CMV), were considered method effects using confirmatory factor analyses (CFA).

1.1. Higher-order factor(s) of personality

Since the introduction of higher-order factors into the research arena by Digman (1997), researchers have attempted to examine the viability of these metatraits, *alpha* and *beta*, as more parsimonious accounts for personality dimensions, which were earlier defined as orthogonal (McCrae & Costa, 1997). Digman interpreted *alpha* (conscientiousness, emotional stability/neuroticism, and agreeableness) as referring to the effects of socialization, which include qualities related to being responsible, productive, and benevolent person, and *beta* (Extraversion and Openness) as related to personal growth and self-actualization. In a series of studies, DeYoung and colleagues found that a two higher-order model of personality, namely the Big Two, was supported (DeYoung, Peterson, & Higgins, 2002; DeYoung, Hasher, Djikic, Criger, & Peterson, 2007), even in the multi-informant data (DeYoung, 2006) in latent space, which they called *stability* and *plasticity*. A strong support has also been provided for the Big Two by other researchers. For example, Jang et al. (2006), showed, using twin pairs, that the Big Two accounted for a considerable amount of variance, and was stable across three samples with different cultural backgrounds.

The search for a more parsimonious model of personality trait organization was not limited to the Big Two. A number of researchers argue that a general factor of personality (GFP) could account for the covariance among personality dimensions (Erdle, Irwing, Rushton, & Park, 2010; Erdle & Rushton, 2011; van der Linden, Bakker, & Serlie, 2011), even in the data from pairs of twins (Veselka, Just, Jang, Johnson, & Vernon, 2012).

1.2. The importance of self-esteem

Although there seems to be general agreement among researchers on the viability of a higher-order factor or factors, some argue that a set of variables other than the metatraits(s) could account for the covariation among personality factors. Extensive research by Erdle and colleagues tested the hypothesis that the covariances among personality factors could be accounted for by self-esteem.

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The basis of their research seems to be the possibility that self-esteem has a biasing effect because of an inclination to rate items of personality consistent with the levels of self-esteem of participants. Erdle, Gosling, and Potter (2009) used a very large sample (628,640) and found that the higher-order factors of stability and plasticity could be validated, even after the effects of self-esteem were controlled using partial correlations in a series of exploratory factor analyses (EFA). Erdle and Rushton (2011) used data from two much smaller samples (*Ns* = 126 and 128) in addition to that used in Erdle et al. (2009); this time, however, the purpose was to obtain evidence for a GFP by controlling for the effects of self-esteem using partial correlations in EFAs. Moreover, their reports of the analyses contain a number of issues that need to be considered. First, in their 2009 study, the intercorrelations among the factors were very low, ranging from .07 to .30, and the correlations ranged from .02 to .27, when the self-esteem was controlled statistically. Related to this, although Erdle and Rushton (2011) argued that the results of their studies supported the viability of GFP, the results were again complicated by variations in factor loadings, with openness and extraversion considerably lower than neuroticism, agreeableness, and conscientiousness except for the second study with a very small sample size ($N = 126$). Other issues that need to be considered are the failure to report correlations among personality factors, and the use of a self-esteem questionnaire with only one-item to gather data from all 628,640 participants. Moreover, they used only EFAs, eliminating the possibility of controlling measurement error. Given these limitations of the earlier research, it is clear that the effects of self-esteem on the measurement of personality need to be carefully examined.

1.3. Current study

Although highly sophisticated methods using multi-informant reports have been used to test the viability of higher-order models (DeYoung, 2006), researchers now use them in their research with no control variable (e.g., DeYoung et al., 2002; van der Linden, Scholte, Cillessen, Nijenhuis, & Segers, 2010). Some researchers, similarly, try to validate higher-order personality models with self-report data without controlling any method effect (e.g., Hull & Beaujean, 2011). As mentioned above, although some tests for the effects of self-esteem on the viability of metatraits have been carried out, these were characterized by inadequate statistical analyses and inconsistent or ambiguous results. Researchers should be aware of the possible biasing effects in the measurement of personality. It is clear that such a situation could result in unwarranted or controversial conclusions about metatraits if it is the case that they have an effect on the measurement of personality using self-report assessment. Thus, using high-level analyses concerning biasing effects with alternative models would add to our understanding of the organization of personality factors. Accordingly, both EFA and CFA were used in the present research, taking into account alternative models. A type of CFA strategy was used to illuminate the effects of self-esteem, as well as CMV, in the assessment of personality in first-order and higher-order measurement models. It was expected that the inclusion of the method effects in the measurement models would make the organization of traits clearer in latent space, which would also enable a clear understanding of the biasing effects of both CMV and self-esteem on the alternative models of higher-order personality, namely, the GFP and the Big Two.

2. Method

The participants were 878 graduate and undergraduate students from two Turkish public sector universities. The mean age was 22.5 with a standard deviation of 5.3. The participants completed the questionnaires in small group sessions.

The 44-item BFI (Benet-Martinez & John, 1998) was administered to assess five personality dimensions – Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. Ratings are indicated on a scale from 1 (disagree strongly) to 5 (agree strongly) for each item. The scale was adapted by Sumer, Lajunen, and Ozkan (2005) who reported Cronbach's Alpha reliabilities ranging from .64 to .77. The coefficients of Alpha were .74, .80, .82, .64, and .79, respectively in the data set used in this study.

The study employed a commonly-used measure of global self-esteem, the Ten-item Rosenberg Self-esteem Inventory (RSEI – Rosenberg, 1965). The respondents' levels of agreement with 10 self-evaluative statements are averaged to produce an index of self-esteem. Responses are specified on a 5-point Likert-type scale, in which higher scores reflect more positive self-evaluations. RSEI was first translated into Turkish by Tugrul (1994), who also reported a Cronbach alpha coefficient of .86. In this study, Cronbach's Alpha was defined by .86.

EFAs and CFAs were implemented using LISREL 8.80 (Jöreskog & Sörbom, 1993). The maximum likelihood estimation method was used in all CFAs with covariance matrices. Self-esteem and CMV were controlled by being defined as latent method variables and being allowed to have paths to the indicators of other observed variables in the model (Johnson, Rosen, & Djurdjevic, 2011; Williams & Anderson, 1994). In such a model, the covariances of method factors with other latent variables in the model were set to zero, while in order to achieve identification the variance of these variables were set to 1.00.

3. Results

In the first phase, a principal components analysis with oblique rotation was carried out on the scores of five factors. The results showed that all factors were loaded on the GFP, with factor loadings ranging from .63 to .72. The GFP accounted for 48% of the variance with 2.38 eigen value.

In the second phase, a series of CFAs were conducted to evaluate the fit of alternative models to the data without any method factor. In these, and the subsequent analyses, item parceling was used to create indicators for the constructs. Three parcels were created for factors with more than 8 items. Thus, all latent variables had three parcels except for extraversion and openness. Means, standard deviations and intercorrelations for the observed variables are represented in Table 1.

Model 1 tested the first-order correlated model without the effects of CMV and self-esteem, and resulted in relatively acceptable goodness of fit statistics: $\chi^2(55, N = 878) = 615.49$, $p < .05$; GFI = 0.90; CFI = 0.93; SRMR = 0.062; RMSEA = 0.11 (90% confidence interval for RMSEA = 0.10–0.12). All factor loadings were statistically significant and large, with the range of .50–.90, most over .70. A test of the GFP (Model 2) resulted in the deterioration of the model fit with the following goodness of fit statistics: $\chi^2(60, N = 878) = 738.35$, $p < .05$; GFI = 0.89; CFI = 0.92; SRMR = 0.072; RMSEA = 0.11 (90% confidence interval for RMSEA = 0.11–0.12). The results [$\chi^2(59, N = 878) = 644.21$, $p < .05$; GFI = 0.90; CFI = 0.93; SRMR = 0.065; RMSEA = 0.11 (90% confidence interval for RMSEA = 0.10–0.11)] of the Big Two model (Model 3) were clearly better than the GFP ($94.14, 1: p < .001$), while slightly worse than the first-order model ($28.72, 4: p < .001$).

In the third phase, the same models were tested taking into account the effects of CMV and self-esteem. Inclusion of these method effects resulted in better goodness of fit statistics for all models. The test of the first-order model with the method effects (Model 4) resulted in the following statistics: $\chi^2(69, N = 878) = 356.24$,

Table 1
Means, standard deviations, and intercorrelations of observed variables.

Observed variables	M	SD	EXT1	EXT2	OPE1	OPE2	OPE3	AGR1	AGR2	AGR3	CON1	CON2	CON3	NEU1	NEU2	SE1	SE2
EXT1	14.06	2.99	–														
EXT2	12.66	3.08	.73**	–													
OPE1	10.79	2.37	.32**	.44**	–												
OPE2	10.13	2.45	.36**	.47**	.65**	–											
OPE3	13.95	2.71	.35**	.38**	.53**	.58**	–										
AGR1	11.39	1.96	.29**	.21**	.10**	.11**	.15**	–									
AGR2	10.64	1.86	.15**	.11**	.22**	.17**	.18**	.41**	–								
AGR3	11.86	1.76	.20**	.14**	.28**	.22**	.21**	.39**	.44**	–							
CON1	11.45	2.63	.10**	.05	.070*	−.04	.13**	.19**	.21**	.27**	–						
CON2	10.90	2.17	.26**	.32**	.55**	.41**	.32**	.11**	.35**	.42**	.34**	–					
CON3	10.59	2.20	.26**	.30**	.37**	.27**	.31**	.13**	.27**	.30**	.47**	.63**	–				
NEU1	10.65	2.99	−.32**	−.22**	−.16**	−.16**	−.26**	−.29**	−.25**	−.30**	−.29**	−.25**	−.41**	–			
NEU2	11.32	2.84	−.37**	−.31**	−.26**	−.27**	−.27**	−.25**	−.12**	−.22**	−.13**	−.28**	−.33**	.66**	–		
SE1	11.98	2.41	.39**	.39**	.32**	.30**	.27**	.15**	.24**	.27**	.13**	.40**	.32**	−.32**	−.35**	–	
SE2	11.94	2.30	.36**	.39**	.37**	.31**	.32**	.13**	.18**	.28**	.15**	.41**	.39**	−.35**	−.35**	.78**	–
SE3	15.90	3.11	.35**	.35**	.27**	.24**	.31**	.14**	.16**	.21**	.25**	.37**	.41**	−.40**	−.37**	.67**	.67**

Notes: $N = 878$; EXT = Extraversion, OPE = Openness, AGR = Agreeableness, CON = Conscientiousness, NEU = Neuroticism, SE = Self-esteem.
* $p < .05$.
** $p < .01$.

$p < .05$; GFI = 0.95; CFI = 0.98; SRMR = 0.037; RMSEA = 0.069 (90% confidence interval for RMSEA = 0.062–0.076). Standardized parameter estimates of this model with those of the first-order model without method effects are represented in Fig. 1.

It can be seen from Fig. 1 that self-esteem had an effect on nearly all indicators, although relatively weakly on agreeableness. These effects resulted in decreases in the factor loadings of the indicators, and also caused considerable change in the correlations among the personality factors. The relationship of conscientiousness with extraversion and openness, in particular, saw a dramatic change.

When self-esteem and CMV were defined as method variables in the GFP model (Model 5), the results were also acceptable: $\chi^2(74, N = 878) = 427.88$, $p < .05$; GFI = 0.94; CFI = 0.97; SRMR = 0.042; RMSEA = 0.074 (90% confidence interval for RMSEA = 0.067–0.081). The parameter estimates of this model and the same model without method effects are shown in Fig. 2. Although the factor loadings were relatively affected by self-esteem, the loadings of the personality factors on the GFP were still large and significant.

Finally, in Model 6, the effects of CMV and self-esteem were modeled in the Big Two model Fig. 3. The results of this model [$\chi^2(73, N = 878) = 343.86$, $p < .05$; GFI = 0.95; CFI = 0.98; SRMR = 0.039; RMSEA = 0.065 (90% confidence interval for RMSEA = 0.058–0.072)] were shown to be better (84.02,1: $p < .001$) than the GFP model (Model 5), while it was again slightly

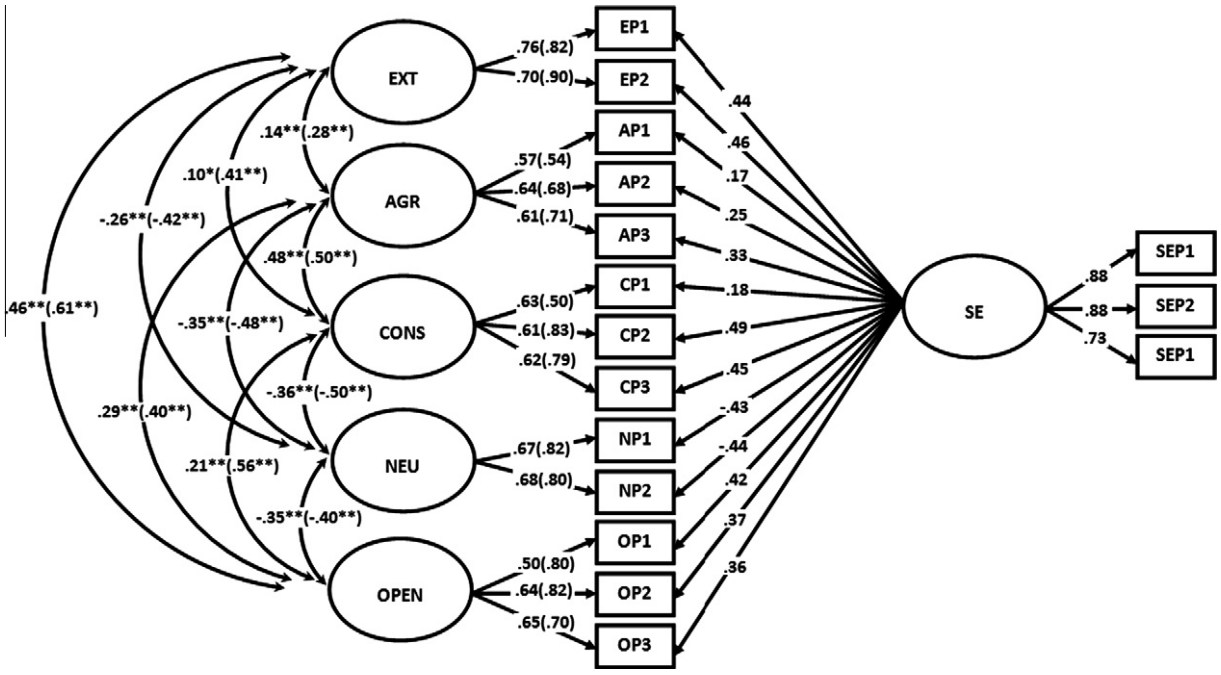

Fig. 1. Standardized parameter estimates for the first-order model with and without self-esteem and CMV as method variables. *Notes:* $N = 878$; EXT = Extraversion, AGR = Agreeableness, CONS = Conscientiousness, NEU = Neuroticism, OPEN = Openness, SE = Self-esteem; all observed variables are the parcels created for the respective scales, the effects of CMV are not represented, the values in parentheses represent the estimates of the model with no method effect; all factor loadings are significant at .01.
**$p < .01$.

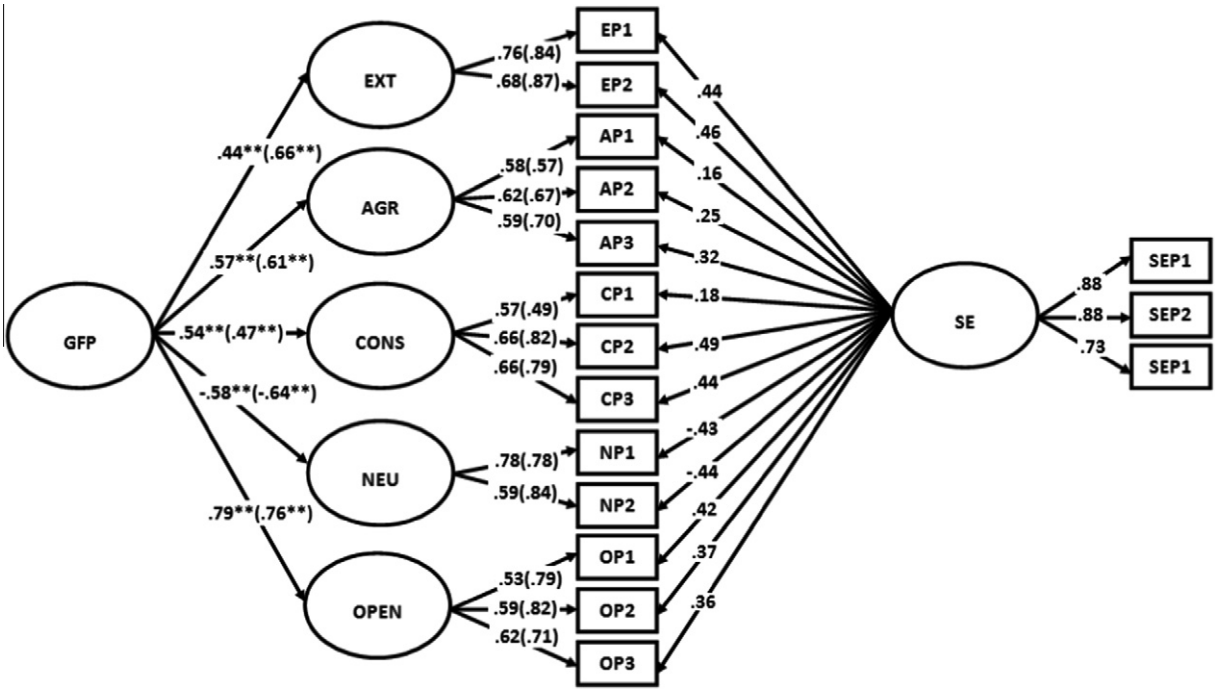

Fig. 2. Standardized parameter estimates for the general factor model with and without self-esteem and CMV as method variables. *Notes:* $N = 878$; GFP = General factor of personality, EXT = Extraversion, AGR = Agreeableness, CONS = Conscientiousness, NEU = Neuroticism, OPEN = Openness, SE = Self-esteem; all observed variables are the parcels created for the respective scales, the effects of CMV are not represented, the values in parentheses represent the estimates of the model with no method effect; all factor loadings are significant at .01. $^{**}p < .01$.

worse (12.38,4: $p < .05$) than the first-order model with the same method effects (Model 4).

It should be noted here that a series of additional analyses were conducted to confirm whether self-esteem rather than CMV was responsible for these effects. The results showed that the parameter estimates did not change dramatically in higher-order models when self-esteem alone was defined as method variable. The loadings in the GFP for extraversion, openness, agreeableness, conscientiousness, and neuroticism were .45, .57, .56, .58, and −.50, respectively. The loadings in the Big Two model were .51, .93, .65, .74, and −.49, respectively. The correlation between stability and plasticity was found to be .41 for the Big Two model test.

4. Discussion

The present study tested a series of models concerning personality, by taking into account the effects of self-esteem and CMV. The results of the EFA showed that only one factor was extracted from the data, known as the GFP in earlier research (Erdle & Rushton, 2010, 2011; Erdle et al., 2010; Musek, 2007). However, the picture dramatically changed when the organization of the traits was examined in a latent space. When no method effect was included into the model, the data supported the first-order correlated model more than the higher-order models. From the two higher-order models, the Big Two was shown to fit the data better than the GFP model. The results did not change, even when the effects of CMV and self-esteem were partialled out from the data using CFAs.

Although the results more strongly supported the first-order model in general, the viability of the Big Two model was still a strong possibility given that this was more parsimonious than the first-order model. The chi-square difference between the Big Two and first-order model was 28.72 with 4 degrees of freedom when the method effects were not present. When these effects were included into the measurement model, the difference was only 12.38 with the same degrees of freedom. Moreover, the correlation between plasticity and stability was reduced to .35 from .72 when the method effects were partialled out. The correlation was still relatively weak when the effects of CMV were not considered in the model.

These results are the first to show the effects of self-esteem on the covariances among the Big Five factors in such detail. Although earlier research by Erdle et al. (2010), Erdle and Rushton (2010, 2011) tested such a hypothesis, the results were complex and lacked clarity, most probably due to the statistical techniques used. The results of the high-level data analysis used in the current study suggest that their results may be untenable.

Erdle et al. (2009) found that an internet based data from a large sample ($N = 628,640$) supported the Big Two model. An analysis of the same data with SEM, however, supported the GFP model (Erdle et al., 2010). The GFP in these analyses, as in Musek (2007), were represented as the third, highest-order level, while two metatraits, stability and plasticity, represented the second-order level. The results were still problematic, because, in addition to the lack of control for common method variance, there are doubts over their treatment of the effects of self-esteem in the model. Another issue was their definition of self-esteem as a second-order latent factor in addition to plasticity and stability, while the GFP was represented as a third-order factor. Finally, they failed to test any alternative model.

In order to test the effects of self-esteem, Erdle and Rushton (2011) reanalyzed the same data, in addition to a new small data set ($N = 126$, Study 2), again finding that self-esteem did not account for the covariances among the personality factors. Although they stated that the data supported the GFP, the factor loadings of extraversion and openness were considerably lower (.34 and .21, respectively) when the effects of self-esteem were controlled using partial correlations in Study 1.

The results of the present study illuminate the inconsistencies among these findings. First, due to more comprehensive tests of

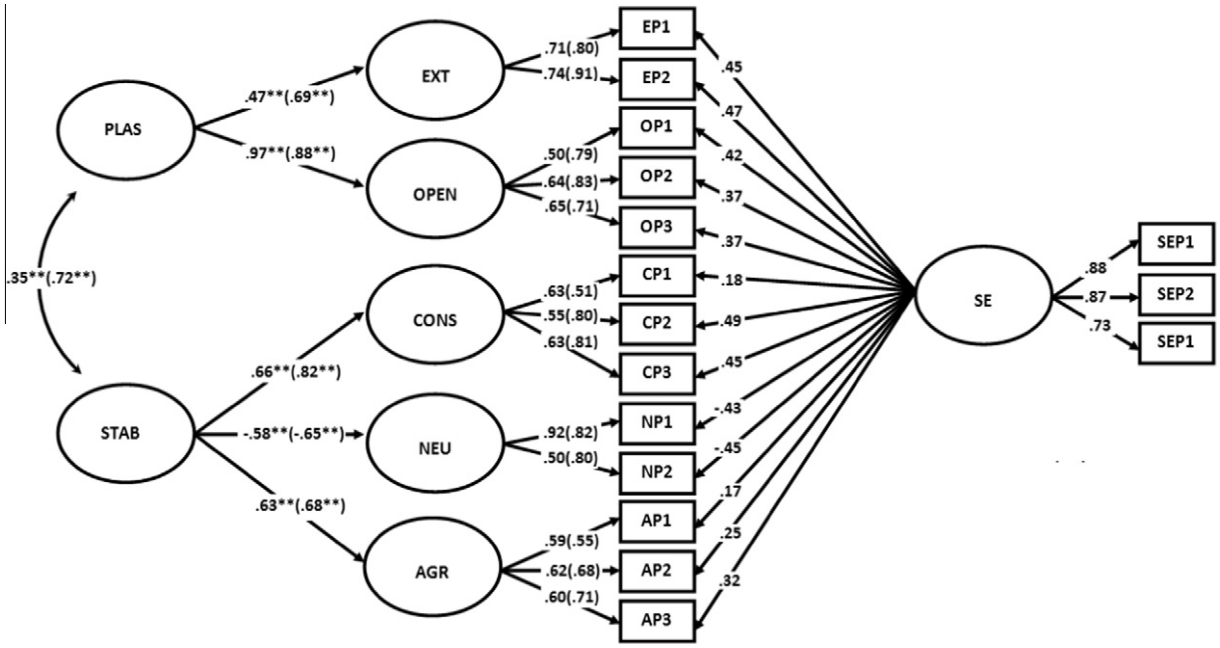

Fig. 3. Standardized parameter estimates for the Big Two model with and without self-esteem and CMV as method variables. *Notes:* $N = 878$; PLAS = Plasticity, STAB = Stability, EXT = Extraversion, AGR = Agreeableness, CONS = Conscientiousness, NEU = Neuroticism, OPEN = Openness, SE = Self-esteem; all observed variables are the parcels created for the respective scales, the effects of CMV are not represented, the values in parentheses represent the estimates of the model with no method effect; all factor loadings are significant at .01. $^{**}p < .01$.

method effects carried out for alternative models, the results clearly showed that although a GFP was tenable using EFA, it was shown to have worse fit to the data than the Big Two. Secondly, the Big Two was also problematic when the method effects were not considered in the model because of the high correlation between plasticity and stability (.72). This latter difficulty, however, was eliminated since it was shown to become much weaker (.35) when the method effects were taken into consideration.

This study, thus, is the first to show the importance of self-esteem in the differentiation between stability and plasticity. Researchers have previously found a higher correlation between *stability* and *plasticity* when self-reports were used, compared to weaker or nonsignificant cross-method correlations (Biesanz & West, 2004; DeYoung, 2006). Anusic, Schimmack, Pinkus, and Lockwood (2009) showed that the correlation among these metatraits in monomethod studies may be largely due to the general tendency to rate oneself in a consistent manner. The results presented here showed that self-esteem levels of the participants had a similar effect on the ratings of personality, and partialling out these effects resulted in orthogonality between stability and plasticity.

The need for studies focused on the effects of self-esteem on the covariances among the factors of personality was the correlation of self-esteem with these factors (Erdle et al., 2009). What Erdle and colleagues wanted to show, in fact, was the spuriousness model in which the correlations among the factors were less than the simple correlations (Williams & Anderson, 1994). However, the present study showed that the spurious effect of self-esteem could only be valid on the higher-order latent space. This means that it is possible that self-esteem is an important factor in the differentiation between *stability* and *plasticity*. That is, when the levels of self-esteem are controlled for, these metatraits become more orthogonal. One reason for such a result could be related to the evaluation concerns, which are claimed to be inherent in personality ratings (Anusic et al., 2009). Another option is to consider self-esteem as an important factor in the theoretical differentiation of these metatraits if they represent basic tendencies (DeYoung, 2006), which should be orthogonal to each other (Anusic et al., 2009). Future research should explore the viability of these possibilities.

In sum, the results presented showed the importance of self-esteem in the accounts of metatraits, especially in the mono-method, e.g., self-report, studies. These results should therefore be considered by researchers interested in examining higher-order personality models in CFA or models in which the metatraits are used. These stress the importance of incorporating self-esteem and CMV as method variables into the models. Hull and Beaujean (2011), for example, presented a high correlation (.78) between stability and plasticity, which allowed them to test a higher-order GFP, without controlling any method factor. Controlling these method–effects could also account, at least partially, for the very strong correlations of the metatraits with some other variables. DeYoung et al. (2002, sample 1), for example, found nearly a perfect correlation between stability and conformity ($\beta = .98$). Blackburn, Renwick, Donnelly, and Logan (2004) found very strong correlations between stability and impulsivity ($\beta = .91$), and between plasticity and withdrawal ($\beta = .90$). Controlling for the important method effects, such as self-esteem, and CMV, is expected to provide researchers with more reliable estimates.

Although the results of the present study provided important information about modeling metatraits in a latent space, it has some limitations. First, although the sample size was adequate for such a test (Bentler & Chou, 1987), cross-validation studies are needed to alleviate the concerns about capitalization on chance and overfitting (Williams & Anderson, 1994). Second, some cross-cultural effects could be at work for the effects of self-esteem on the covariance between metatraits. Future research should examine such a possibility.

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