# Predicting Counterproductive Work Behavior from a Bi-factor Model of Big Five Personality

Authors

**Nhung T. Nguyen**, Towson U., nnguyen@towson.edu
**Michael Biderman**, U. of Tennessee, Chattanooga, michael-biderman@utc.edu

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Abstract

In this study, a bifactor model was shown to explain Big Five personality data significantly better than a simple CFA model in predicting counterproductive work behavior using a sample of 299 undergraduate students from two U.S. universities. Specifically, after removing the bifactor variance - extraversion became significant predictor of task performance defined as academic performance and counterproductive work behavior such as academic dishonesty even after controlling for cognitive ability and gender. Discussion was made concerning using bifactor model in improving the predictive validity of the Big Five personality.

## Introduction

Research on validating personality measures for predicting job performance continues to be of interest to organizational researchers despite the low validity estimates associated with the Big Five measures over the past forty years of research (Morgeson, Campion, Dipboye, Hollenbeck, Murphy, and Schmitt, 2007). Morgeson et al. (2007) noted that "the observed validities of personality tests predicting job performance criteria are low and have not changed much over time" (Morgeson et al., 2007, p. 1032). Meta-analyses have shown that only two Big Five personality constructs, conscientiousness and emotional stability, have generalized validities for predicting performance across jobs and organizational contexts with average uncorrected validities to be .15 and .09 (Hurtz & Donovan, 2000).

Much research has been devoted to improving the validity of personality tests for selection such as using compound personality variables (e.g., a combination of personality traits such as integrity reported in Ones & Viswesvaran, 2001; employee reliability, Hogan & Hogan, 1989); using personality at the facet level (e.g., looking at achievement and dependability as facts of conscientiousness reported in Ones, Dilchert, Viswesvaran, & Judge, 2007); examining potential moderators of personality-performance relationships (e.g., social skill, Witt & Ferris, 2003; the nature of the job, Witt, Burke, Barrick, & Mount, 2002); and most recently, examining the potential non-linearity of personality-performance relationship (Whetzel, McDaniel, Yost, & Kim, 2010). Using data from the forced choice version of the Occupational Personality Questionnaire (OPQ32*i*), Whetzel et al., (2010) found little evidence for non-linearity and when there was evidence, the magnitude of deviation from linearity was small.

Another line of research, one which has just started to draw attention from researchers, stems from whether the structure of personality can be better understood by applying a bifactor model. A bifactor model is one in which a general first order factor orthogonal to and in addition

to the substantive factors influences all personality items in a questionnaire. This general factor is also known as a common method factor (Podsakoff et al., 2003). Figure 1 presents a diagrammatic bifactor model applied to the Big Five personality items as reflected in the International Personality Inventory Pool (IPIP) available to the public at ipip.ori.org. Evidence supporting the bifactor model in personality testing was reported by Biderman, Nguyen, and Sebren (2008) in which they found conscientiousness measured from application of a bifactor model was more valid than when measured using a raw conscientiousness scale score. They argued that inclusion of the bifactor accounted for contamination present in the raw scale scores. After removing the contaminating variance by applying the bifactor model to the conscientiousness item level data, they found the validity of conscientiousness increased from (r = .09) to (r = .20) in predicting undergraduate academic performance (Biderman et al., 2008, Table 2, p. 892). More recently, Biderman, Nguyen, Cunningham, and Ghorbani (2011) provided evidence that partialling out the variance due to a bifactor such as that shown in Figure 1 dramatically changed the correlations of Big Five factors with external variables. Finally, Klehe, Kleinmann, Hartstein, Melchers, König, Heslin, & Lievens (2012) provided evidence that the bifactor significantly improves the goodness of fit of a confirmatory factor analysis (CFA) to Big Five data and represents response distortion in applicant settings.

The purpose of this study is to extend previous research of Biderman et al. (2008) to investigate the role of other personality factors such as extraversion in predicting both task performance (i.e., academic performance) and counterproductive work behavior (i.e., academic dishonesty), two important dimensions of work performance based on Borman and Motowidlo's (1993) framework. Specifically, it is expected that after partialling out bifactor variance, the

criterion related validity of extraversion will improve in predicting both academic performance and counterproductive work behavior.

*Hypotheses Development*

Extraversion, a dimension of the Big Five personality model, has also been called surgency (e.g., Goldberg, 1999). Traits associated with this factor include being outgoing, assertive, dominant, talkative, gregarious, and excitement seeking. Other researchers (e.g., Johnson, 2003) viewed this factor as consisting of four sub-facets of sociability, unrestraint, assertiveness and adventurousness.

Although there is a well-documented body of research showing the role of conscientiousness defined as traits such as responsible, hardworking, organized, and rule-bound, in predicting academic performance over and beyond cognitive measures of general intelligence, standardized test scores such as SAT and high school coursework performance both in the USA and the UK (e.g., Poropat, 2009; Wolfe & Johnson, 1995; Chamorro-Premuzic & Furnham, 2003); evidence concerning the role of extraversion in predicting performance remains mixed. Some studies reported significant positive relationships (e.g., Judge & Erez, 2007) while others reported a negative relationship between extraversion and course grade as well as extraversion and cumulative grade point average (e.g., Nguyen, Allen, & Fraccastoro, 2005) and yet others reported non-significant relationships (e.g., Poropat, 2009). There are at least two reasons explaining why extraversion might predict academic performance inconsistently in prior research. First, extraversion was found to positively related to task performance when task performance was teamwork and teamwork related because extroverts are more sociable than introverts that allow them to interact more successfully and comfortably with others in teams. However, in tasks where independent thinking and work are required, extraversion tends to be inversely related to task performance because extroverts will be distracted from doing their work

and focusing on their work because of their tendency to seek socialization and stimulation. In fact, several prior studies reported an inverse relationship between extraversion and task performance (e.g., Nguyen et al., 2005; Wolf & Ackerman, 2005). In college, most courses require independent thinking and efforts to perform well while teamwork reflects a small portion of the semester grade, it is expected that extraversion will be inversely related to cumulative grade point average.

Le, Schmidt, Harter, & Lauver (2010) pointed out that measurement errors such as transient errors and scale specific factor errors downwardly bias substantive relationship at the construct level. Using a CFA technique with data from the Gallup organization measuring job satisfaction and organization commitment, the authors were able to demonstrate that without taking into account these measurement errors, the above two constructs appeared to be more distinct than they actually were. Biderman and colleagues recently showed that the bifactor estimated from the data of a Big Five questionnaire reflected respondent's affective state when responding to a personality item under the instruction to respond honestly (Biderman, Nguyen, Cunningham, Chen, & Watson, 2013). Based on the above discussion, it is reasonable to expect that after bifactor variance is partialled out, the substantive relationship between extraversion and academic performance will improve when participants respond honestly to personality assessment. Thus, we hypothesize:

H1: When the bifactor variance is partialled out, the criterion related validity of extraversion will be improved in predicting academic performance.

Despite a large body of research examining the linkage between individual characteristics (e.g., age, sex, cognitive ability) and academic dishonesty, very few studies looked at personality and academic dishonesty relationship. One study that we are aware of found excitement seeking,

a dimension of extraversion to be inversely related to academic cheating behavior using a sample of South African students (de Bruin & Rudnick, 2007). Given the prevalence of academic cheating in the United States (e.g., McCabe, Trevino, & Butterfield, 2001; McCabe, Butterfield, & Trevino, 2006), we expect the pattern of the relationship will hold and even be stronger among a sample of U.S. students. Extraverts are risk takers because they seek risks to avoid boredom. Cheating may represent a risk and a chance to seek adrenaline rush. Therefore, extraverts are expected to be more likely to cheat than introverts. In fact, a previous study showed that students who were likely to cheat during a final examination scored higher on extraversion (e.g., Singh & Arktar, 1972; De Bruin & Rudnick, 2007) than those not likely to cheat. In maintaining personal relationships, Orzeck and Lung (2005) found those who described themselves as extroverts were more likely to be cheaters than those describing themselves as introverts. Thus, we propose the following:

H2: After removing the bifactor variance, the validity of extraversion compared to that of raw extraversion scale score in predicting academic dishonesty behavior will be improved. .

## Method

### *Sample and procedure*

Data for this study come from a larger validation study. A total of 299 undergraduate students from two U.S. universities participated in the study for partial course credit. Participation in the research was voluntary and participants may discontinue their participation at any time without penalty. Their mean age was 21.37 (SD = 3.03) ranging from 17 to 40 years of age. The majority of the sample was female (185 or 61.9%) and White (228 or 77%). The remaining ethnic groups include 10.5% Blacks, 6.4% Asians, 6.1% mixed with 3 participants not reporting their ethnicity.

Data collection was conducted entirely on-line. Participants were first directed to log into a web site to complete the Wonderlic Personnel Test – Quicktest (WPT-Q), a cognitive ability test. Upon completion of the Wonderlic, which is a timed test at eight minutes, participants were directed to log into another web site hosted by SHL, a U.K. human resources consultancy to complete the Occupational Personality Questionnaire (OPQ) – data for the OPQ were not included in this paper. Upon completion of the OPQ, which is a non-timed test, participants were directed to a third and last web site to complete a personality measure, an academic dishonesty measure, and some demographic information. The personality measure is available free of charge from the International Personality Inventory Pool (IPIP) web site while the academic dishonesty measure was adapted from previous research that will be discussed in later paragraphs. The total time it takes for participants to complete all study measures was typically fifty minutes. Participants were given a choice to complete all measures in one administration or go back to finish incomplete measures at a later time.

*Measures.*

*Cognitive ability.* This variable was measured using the Wonderlic Personnel Test – quicktest (WPT-Q). This test was administered online in an un-proctored environment via a web site hosted by Wonderlic, Inc. According to the test publisher, this test was considered predictive of the proctored WPT version, which has a well-established psychometric property. In this study, the average WPT-Q score was 23 with a wide variation, ranging from 6 to 33. No Cronbach's alpha estimates were available for this variable as data for this variable were provided from Wonderlic, Inc. – the company that hosted and administered the test remotely.

*IPIP Big Five.* The Big Five personality measure used in this study is the 50-item Sample Questionnaire from the International Personality Item Pool (IPIP) web site (www.ipip.org). The

measure taps Five dimensions of personality, i.e., extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience or intellect. Each dimension was measured with ten Likert type items. Participants were asked to indicate the extent to which each item accurately described them. Scale anchors ranged from 1 "very inaccurate" to 7 "very accurate". Cronbach's alphas for internal consistency estimates were .91, .83, .79, .86, and .83 for Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness for Experience respectively.

*Academic dishonesty.* We adapted the Academic Dishonesty Inventory (ADI) developed by Newstead et al. (1996) and Koljantic and Silva (2002) to measure academic dishonesty behavior. Sixteen Yes-No items constitute this scale. Participants were asked to indicate whether in the past two years they had engaged in unethical behavior at least once. Scale items were coded as "0" for not yet engaged in unethical behavior and "1" for having engaged in unethical behavior at least once over the past two years. Sample items include "paraphrased material from a book without acknowledging the source"; "fabricated reference or a bibliography"; "copied from a neighbor during an examination". Since the distribution of raw sums of items was highly positively skewed, scores were calculated by a square root transformation to reduce the positive skew of the original raw scale scores. The transformed variable had zero skew, which was used in subsequent analyses. Internal consistency estimate for this variable was .77.

*Academic performance.* Self-reported cumulative grade point average (GPA) was used to measure academic performance in this study. Participants were asked to indicate their cumulative GPA to the two decimal points. Self-reported GPAs were found to correlate quite highly ($r = .62$, $p < .001$) with GPAs retrieved from university records (e.g., Zimmerman, Caldwell, & Bernart, 2002).

*Statistical models.*

The bifactor model of Figure 1 was applied to the data of individual item responses using M*plus* Version 7.0 (Muthen & Muthen, 1998-2012). Previous research on application of this model has indicated that addition of a bifactor increases goodness of fit significantly (Biderman et al., 2011) over a model without the bifactor. The results here replicated those of Biderman et al. For a model with oblique Big Five factors but no bifactor, goodness-of-fit statistics were $\chi^2$ = 2909.323 (*df*=1165), CFI= 0.720, RMSEA = 0.1, and SRMR = 0.087. For the model with a bifactor (Figure 1), $\chi^2$ = 2549.107 (*df*=1115), CFI = 0.770, RMSEA = 0.066, and SRMR = 0.075. Biderman et al. (2011) noted that goodness-of-fit measures of model applied to item data are traditionally poorer than the same measures applied to data for which items have been grouped into parcels and the parcels used as indicators. They attributed the poor fit to idiosyncratic characteristics of the data not accounted for by the five or six factors in the model. Many of those idiosyncratic characteristics are masked when items are grouped into parcels[1].

Inspection of the results of model application shown in Figure 1 indicated that half of the loadings of items on the Big Five Openness factor were negative, while the loadings of those same items on the bifactor were quite large. These results were not consistent with previous applications of the model to this particular questionnaire, e.g., Biderman et al. (2011, Table 4). For this reason, an alternative version of the bifactor model was applied. In this alternative version, the raw loadings of all items on the bifactor were set equal. Goodness-of-fit statistics for this model were $\chi^2$ = 2819.777 (*df* = 1164), CFI = 0.735, RMSEA = 0.069, and SRMR = 0.092. For this model, the loadings of all items on all factors were positive.

[1] As a test of this hypothesis, two-item parcels were formed from the items from each scale, yielding five parcels as indicators for each Big Five dimension. A bifactor model was fit to those data yielding $\chi^2$ = 494.753 (df=240), CFI = 0.930, RMSEA = 0.060, SRMR = 0.055, a noticeable improvement. However, because there were no large differences between the factor scores from the model applied to individual item data and those applied to parceled data, the results here were based on those from the item analyses.

Factor scores for the Big Five factors were computed by Mplus using the regression method (Muthén, 1998-2004). These factor scores were added to the data set containing the raw data and scale scores for the analyses that follow. As a check on the reliability of the factor scores, factor determinacy values were computed for each factor. The factor determinacies were 0.933, 0.893, 0.853, 0.894, 0.848, and 0.816 for extraversion, agreeableness, conscientiousness, stability, openness, and the bifactor, respectively.

A check on the convergent validity of the factor scores computed in this model in which the loadings of items on the bifactor were constrained with factor scores from a model in which loadings were freely estimated was done. Convergent validity correlations between corresponding factor scores were larger than 0.8 for extraversion, agreeableness, conscientiousness, and stability. As would be expected, those for openness and the bifactor were considerably lower. Clearly, further research on the reasons for the anomalous fit of the model when all loadings are freely estimated is required.

## Results

Table 1 shows descriptive statistics and intercorrelations among variables in the study. As shown in Table 1, extraversion scale scores did not exhibit any significant relationships with cumulative grade point average ($r$ = -.10, $p$ >.05) or academic honesty ($r$ = .10, $p$ >.05). However, when a bifactor was added to the confirmatory factor analysis of the Big Five variables, after partialling out the bifactor variance, the pure extraversion factor score showed significant relationships with both cumulative grade point average ($r$ = -.13, $p$ < .05) and academic dishonesty ($r$ = .15, $p$ < .01). These findings provide preliminary support for both Hypothesis 1 and Hypothesis 2, which will be discussed in detail in the following paragraphs.

Hypothesis 1 states that after partialling out the bifactor variance, the criterion related validity of extraversion in predicting academic performance will be improved. To test this hypothesis, we conducted a hierarchical regression analysis, in which cumulative grade point average was regressed onto sex and cognitive ability in the first step (these two variables served as control variables because they had significant zero-order correlation with cumulative grade point average); then onto pure extraversion in the second step. Table 2 shows this regression results. As shown in the Table, after controlling for sex and cognitive ability, pure extraversion became marginally significant, explaining 1% of variance in cumulative grade point average above and beyond sex and cognitive ability. Hypothesis 1 was weakly supported.

Hypothesis 2 states that after partialling out the bifactor variance, the criterion related validity of extraversion in predicting academic dishonesty will be improved. To test this hypothesis, we conducted a hierarchical regression analysis, in which academic dishonesty was regressed onto sex and cognitive ability in the first step; then onto pure extraversion in the second step. Table 3 shows the results of this analysis. As shown in the Table, extraversion purely estimated significantly explained 2% of variance in academic dishonesty. Thus, hypothesis 2 was fully supported.

## Discussion

In this study, we extended previous research (e.g., Biderman et al., 2008) by applying a bifactor model to estimating the factor structure of the Big Five personality model. Consistent with previous research, the bifactor model had better fit than the model without a bifactor. Furthermore, after removing the bifactor variance, the personality variable of extraversion became significant predictor of both task performance (i.e., cumulative grade point average) and counterproductive work behavior (i.e., academic dishonesty behavior).

It is important to note that the effect of extraversion on academic dishonesty as documented in this study is likely underestimated because this variable was measured as a self-report variable. Given the tendency of participants to report this deviant behavior in a socially desirable way, this variable's true effect size is likely to be higher. Regardless, two percent of variance explained by extroversion purely estimated is of practical significance. One study showed that students who cheated while in college would be likely to display counterproductive work behavior later when they entered the workplace. The correlation between academic dishonesty and workplace deviant behavior was quite high for both undergraduate students ($r = .66$, $p < .001$) and graduate students ($r = .61$; $p < .001$) (Nonis & Swift, 2001). Based on our study findings, it is time human resource practitioners started screening job applicants based on extroversion in addition to conscientiousness and emotional stability.

These results are in line with the large body of evidence concerning the impact of method effects on criterion-related validity. It has generally been found that such effects act to reduce the correlations between predictors and criteria. For example, Johnson, Rosen, & Djurdjevic (2011) found that the relationship between of the core self-evaluation construct to job satisfaction was considerably reduced when either experimental or statistical controls for common method variance were introduced. The results of this study are in line with those and other previous results – measuring constructs with the effects of common method factors, in this case, the bifactor of Figure 1 – removed yields larger correlations with external factors.

One implication of the present findings is that researchers can increase the likelihood of finding significant relationships between constructs by measuring those constructs using techniques from the application of confirmatory factor analyses and structural equation models. Relationships can be examined from within the confines of the models or they can be examined

by computing factor scores and using traditional statistical packages. As long as the factor score determinacy values are acceptable, use of factor scores would seem to be an acceptable practice (Bollen & Paxton, 1998).

## Conclusion

In this study, we extended extant and previous research on using a confirmatory factor analytic technique to model a bifactor in order to purify the substantive construct the result of which is to improve its predictive d. We demonstrated that extraversion, a factor of the Big Five personality model, became a significant predictor of task performance and counterproductive behavior after its bifactor variance was removed. We hope that this study adds another confirming voice to the call to use factor scores in future validation research.

References

Biderman, M. D., Nguyen, N. T., Cunningham, C. L. J., & Ghorbani, N. (2011). The ubiquity of common method variance: The case of the Big Five. *Journal of Research in Personality, 45*, 417-429.

Biderman, M.D., Nguyen, N.T., Cunningham, C.L.J., Chen, Z., & Watson, P. (2013). *Method factors, bifactors, and item valence*. Paper scheduled for presentation at the 28th Annual Conference of the Society for Industrial & Organizational Psychology, Houston, TX: April.

Biderman, M. D., Nguyen, N. T., & Sebren, J. (2008). Time-on-task mediates the conscientiousness--performance relationship. *Personality and Individual Differences*, *44*, 887-897.

Bollen, K. A., & Paxton, P. (1998). Detection and determinants of bias in subjective measures. *American Sociological Review, 63*, 465-478.

Chamorro-Premuzic, T., & Furnham, A. (2003). Personality predicts academic performance: Evidence from two longitudinal studies on British University students. Journal *of Research in Personality, 37,* 319-338.

De Bruin, G.P., & Rudnick, H. (2007). Examining the cheats: The role of conscientiousness and excitement seeking in academic dishonesty. *South African Journal of Psychology, 37,* 153-164.

Goldberg, L. R. (1999). A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In I. Mervielde, I. Deary, F. De Fruyt, & F. Ostendorf (Eds.) *Personality psychology in Europe*, Volume 7. Tilburg, The Netherlands: Tilburg University Press, 7–28.

Hogan, J., & Hogan, R. (1989). How to measure employee reliability. *Journal of Applied Psychology*, *74*(2), 273-279.

Hurtz, G.M., & Donovan, J.J. (2000). Personality and job performance: The Big Five revisited. *Journal of Applied Psychology, 85*, 869-879.

Johnson, J. W. (2003). Toward a better understanding of the relationship between personality and individual job performance. In M. R. Barrick, & A. M. Ryan (Eds) *Personality and work: Reconsidering the role of personality in organizations.* San Francisco, CA: Jossey-Bass, 83–120.

Johnson, R. E., Rosen, C. C., & Djurdjevic, E. (2011). Assessing the impact of commmon method variance on higher order multidimensional constructs. *Journal of Applied Psychology, 96,* 744-761.

Judge, T. A., & Erez, A. (2007). Interaction and intersection: The constellation of emotional stability and extraversion in predicting performance. *Personnel Psychology*, 20, 573-596.

Klehe, U.-C., Kleinmann, M., Hartstein, T., Melchers, K., König, C., Heslin, P. & Lievens, F. (*2012*). Responding to Personality Tests in a Selection Context: The Role of the Ability to Identify Criteria and the Ideal-Employee Factor. *Human Performance, 25, 273-302*.

Koljatic, M. & Silva, M. (2002). Comparison of Students' and Faculty's Perceptions of Occurrence of Dishonest Academic Behaviors, *Psychological Reports,* 90:3, 883-888.

Le, H., Schmidt, F.L., Harter, J.K., & Lauver, K.J. (2010). The problem of empirical redundancy of constructs in organizational research: An empirical investigation. *Organizational Behavior and Human Decision Processes, 112,* 112-125.

McCabe, D.L., Trevino, L.K., & Butterfield, K.D. (2001). Cheating in academic institutions: A decade of research. *Ethics & Behavior, 11,* 219.

McCabe, D.L., Butterfield, K.D., & Trevino, L.K. (2006). Academic dishonesty in graduate business programs: Prevalence, causes, and proposed action. *Academy of Management Learning & Education, 5,* 294-305.

Morgeson, F.P., Campion, M.A., Dipboye, R., Hollenbeck, J.R., Murphy, K., & Schmitt, N. (2007). Reconsidering the use of personality tests in personnel selection contexts. *Personnel Psychology, 60,* 683-729.

Muthén, B. O. (1998-2004). *Mplus Technical Appendices.* Los Angelese, CA: Muthén & Muthén.

Muthén, L. K., & Muthen, B. O. (1998-2012). *Mplus User's Guid*e, Seventh Edition. Los Angeles, CA: Muthén & Muthéen.

Newstead, S.E., Franklyn-Stokes, A., and Armstead, P. (1996). Individual Differences In Student Cheating, *Journal of Educational Psychology*, 88:2, 229-241.

Nguyen, N. T., Allen, L. C., & Fraccastoro, K. (2005). Personality Predicts Academic Performance: Exploring the moderating role of gender. *Journal of Higher Education Policy & Management* , 27, 105-116.

Nonis, S., & Swift, C.O. (2001). An examination of the relationship between academic dishonesty and workplace dishonesty: A multicampus investigation. *Journal of Education for Business, 77,* 69-77.

Ones, D.S., Dilchert, S., Viswesvaran, C. & Judge, T.A. (2007). In support of personality assessment in organizational settings. *Personnel Psychology, 60,* 95–1027.

Ones, D.S. and Viswesvaran, C. (2001). Personality at work: Criterion-focused occupational personality scales used in personnel selection. In Roberts, B.W. and Hogan, R. (Eds.),

*Personality psychology in the workplace* (pp. 63–92). Washington, DC: American Psychological Association.

Paulhus, D. L., & Martin, C. L. (1987). The structure of personality capabilities. *Journal of Personality and Social Psychology, 52*, 354-365.

Podsakoff, P.M., MacKenzie, S. B., Lee, J., & Podsakoff, N.P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*, 879-903.

Poropat, A. E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological Bulletin*, *135*(2), 322-338.

Singh, U.P., & Akhtar, S.N. (1972). Personality variables and cheating in examinations. *Indian Journal of Social Work, 32,* 423-428.

Witt, L.A., & Ferris, G.R. (2003). Social skill as moderator of the conscientiousness – performance relationship: Convergent results across four studies. *Journal of Applied Psychology, 88,* 809-821.

Witt, L. A., Burke, L. A., Barrick, M. A., & Mount, M. K. (2002). The interactive effects of conscientiousness and agreeableness on job performance. *Journal of Applied Psychology*, *87*, 164-169.

Whetzel, D.L., McDaniel, M.A., Yost, A.P., & Kim, N. (2010). Linearity of personality-performance relationships: A large scale examination. *International Journal of Selection and Assessment, 18,* 310-320.

Wolf, M., & Ackerman, P. (2005). Extraversion and intelligence: A meta-analytic investigation. *Personality and Individual Differences, 38,* 531-542.

Wolfe, R. N., & Johnson, S. D. (1995). Personality as a predictor of college performance. Educational and Psychological Measurement, 55, 177–185.

Zimmerman, M. A., Caldwell, C., & Bernat, D. (2002). Discrepancy between self-reported and school-reported grade point average: Correlates with psychosocial outcomes among African American adolescents. *Journal of Applied Social Psychology*, *32*(1), 86-109.

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Table 1. Descriptive statistics and intercorrelations among variables in the study (N = 278)

| Variables | Mean | Std. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Sex | 1.60 | .49 | - | | | | | | | | | |
| 2. Extraversion - raw | 4.39 | 1.09 | -.01 | .91 | | | | | | | | |
| 3. Extraversion - pure | .00 | .94 | .02 | .95 | - | | | | | | | |
| 4. Agreeableness | 5.18 | .80 | .38 | .21 | .16 | .83 | | | | | | |
| 5. Conscientiousness | 4.85 | .76 | .02 | .11 | -.09 | .15 | .79 | | | | | |
| 6. Emotional stability | 4.05 | .93 | -.28 | .20 | .11 | .06 | .22 | .86 | | | | |
| 7. Openness | 4.70 | .79 | -.21 | .21 | .01 | .22 | .18 | .26 | .83 | | | |
| 8. Cumulative GPA | 3.28 | .44 | .08 | **-.10** | **-.13** | .01 | .13 | -.07 | .05 | - | | |
| 9. Cognitive ability | 23.68 | 4.36 | -.26 | -.09 | -.12 | -.12 | -.01 | .14 | .13 | .18 | - | |
| 10. Dishonesty | .36 | .26 | -.07 | **.10** | **.15** | -.08 | -.17 | -.13 | -.11 | .01 | .02 | .77 |

Note: Correlations ≥ .12 are significant at $p < .05$; correlations ≥ .15 are significant at $p < .01$ (two-tailed). Sex was coded as 1 = male; 2 = female. Reliabilities are shown along the diagonal.

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Table 2. Hierarchical regression results regressing GPA onto extraversion (N = 278)

| Independent variable | Standardized regression coefficient | $R^2$ | $\Delta R^2$ | t-value | *p* |
|---|---|---|---|---|---|
| Step 1. | | | | | |
| Sex | .14 | | | 2.29 | .02 |
| Cognitive ability | .20 | .044 | .044 | 3.01 | .00 |
| Step 2. | | | | | |
| Pure extraversion | -.11 | .053 | .009 | -1.90 | .06 |

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Table 3. Hierarchical regression results regressing dishonesty onto extraversion (N = 299)

| Independent variable | Standardized regression coefficient | $R^2$ | $\Delta R^2$ | t-value | *p* |
|---|---|---|---|---|---|
| Step 1. | | | | | |
| Sex | -.08 | | | -.03 | .97 |
| Cognitive ability | -.00 | .00 | .00 | -.14 | .17 |
| Step 2. | | | | | |
| Pure extraversion | .16 | .02 | .02 | 2.79 | .01 |

Figure 1. Bi-factor Model of Personality (as measured by the IPIP)