Intelligence 56 (2016) 35–37

Contents lists available at ScienceDirect

Intelligence

Replication of the association between general intelligence and the general factor of personality using the California Child Q-set

Curtis S. Dunkel [a,*], Tomas Cabeza de Baca [b]

[a] Western Illinois University, United States
[b] University of Arizona, United States

ARTICLE INFO

Article history:
Received 1 July 2015
Received in revised form 18 February 2016
Accepted 18 February 2016
Available online xxxx

Keywords:
General factor of personality
Childhood
Q-sort

ABSTRACT

The purpose of this investigation was to test the replicability of the positive correlation between a general factor of personality (GFP) derived from the California Child Q-set (CCQ) and general intelligence. Analyses were performed using data from two samples of children in which the participants were administered both a test of general cognitive ability and had their personality judged by raters using the CCQ. The results were consistent with previous results in which a positive correlation was found between the CCQ Big Five-based GFP and general intelligence. Future research should help to determine why GFPs derived from some measures correlate positively with general intelligence while GFPs derived from other measures do not.

1. Introduction

The field of psychology has witnessed an increased push for adherence to the core scientific tenet of replication (e.g., Asendorpf et al., 2013). The need for replication is especially important in circumstances when the findings of a particular study deviate substantially from those of other studies examining a related phenomenon. Thus the purpose of this research note is to test the replicability of a finding on the relationship between personality, specifically the shared variance between personality traits known as the general factor of personality (GFP), and general intelligence (*g*) reported by Dunkel (2013). Using data from the Block and Block (2006) longitudinal study Dunkel (2013) found correlations between a GFP based on the Big Five personality traits of openness, conscientiousness, extraversion, agreeableness and neuroticism and measures of *g* averaging $r = 0.42$ across single waves of data collection from childhood to late adolescence. When a stable GFP, the GFP averaged across waves of data collection, was correlated with WAIS scores at age 18 the correlation was $r = 0.70$.

These findings are in contrast to other findings on the relationship between a GFP based on the Big Five and *g* which Dunkel, van der Linden, Beaver, and Woodley (2014) estimated to be $r \approx 0.11$. Indeed, more recent research suggests that this estimated correlation may actually be too high (see Table 2 of Loehlin et al., 2015). Dunkel (2013) attributed the discrepancy in the magnitude of the Big Five-based GFP-*g* correlation to the methods used to measure the Big Five. In the Block and Block (2006) data used by Dunkel (2013) the Big Five were measured using the California Child Q-set (CCQ; Block, 1978) and personality scores were based on the ratings of independent judges. Most other studies estimating the association between the Big Five-based GFP and *g* have used self-report Likert-type measures to assess the Big Five.

In summary, the current investigation is simply an attempt to test the replicability of the findings of Dunkel (2013). Dunkel (2013) identified the methods used in the Block and Block (2006) as the reason for the relatively strong association found between the Big Five-based GFP and *g*. If data from other samples using similar methods does not yield comparable associations, then it would appear that the results of Dunkel (2013) are anomalous and should be viewed as such. To this end, to test the replicability of the association between a Big Five-based GFP derived from independent raters using the CCQ and *g* we were able to secure two data files which are henceforth described.

2. Method

2.1. Sample 1: Longitudinal Study of Icelandic Children

One-hundred and eighty-five, seven to eight year-old Icelandic children ($M = 7.46$, $SD = 0.31$) were included in the sample. Participants were interviewed in three sessions. During one session the Raven's Progressive Matrices was administered and participant's score on the matrices represent *g*.

The method of Q-sorting the participant's personality varied slightly based on the location of the participants' school (identified as children residing in urban or rural locals). For children in urban locations after each of the three interviews the interviewer typed a 1–2 page summary describing the participant's behavior and personality. For children from

* Corresponding author at: Department of Psychology, Western Illinois University, Waggoner Hall, Macomb, IL 61455, United States.
E-mail address: c-dunkel@wiu.edu (C.S. Dunkel).

http://dx.doi.org/10.1016/j.intell.2016.02.007
0160-2896/

rural locations similar interviewer summaries were themselves further abridged by a child psychologist who described each child's behavior and personality in 1–2 pages. These summaries were then used by three or more judges to create personality profiles of the participants using the CCQ.

The profiles were then scored using the protocol of John, Caspi, Robins, Moffit, and Stoughamer-Loeber (1994) to derive Big Five personality trait scores for each participant. A GFP was computed three ways. For each manner of calculating a GFP the scores were first standardized. The first manner in which the GFP was calculated is called unit weighting. The unit weighted GFP was calculated by adding the standardized scores for openness, conscientiousness, extraversion, and agreeableness scores and subtracting the neuroticism score. Next, the same procedure was followed, but the openness and conscientiousness scores were omitted from the equation. This was done to test the possibility that any association with *g* is simply a function of these two traits. Lastly, a GFP was calculated by weighting the traits using the factor loading for each trait on the first unrotated factor from an exploratory factor analyses from the meta-analysis of Van der Linden, te Nijenhuis, and Bakker (2010). Thus, in this method the standardized scores were first multiplied by their factor loading prior to computation. For a more detailed description of this sample and the methods see Hart, Hofman, Edelstein, and Keller (1997).

2.2. Sample 2: Munich Longitudinal Study on the Genesis of Individual Competencies

One-hundred and fifty-one children were assessed for three continuous years between ages four and six. At ages four and five verbal intelligence was assessed with a version of the WPPSI. At ages four and six non-verbal intelligence was assessed using the Columbia Mental Maturity Scale. The verbal and non-verbal scores were standardized and summed to form a composite representing *g*.

Each of the three years the participants attended the same preschool and at the end of each year their primary teacher used a truncated version of the CCQ (54 items) to rate the participant's personality. The scores for each year were aggregated at the item level. Because only 54 CCQ items were used, a modified version of the John et al. (1994) protocol for calculating the Big Five scores was developed; see Asendorpf and Van Aken (2003) for a more detailed description of the participants and procedures including the scoring modification. The same methods described previously in the first sample for computing various GFPs were followed again.

3. Results and discussion

There was missing data on the variables of interest in both samples. Sample 1 had 17 cases missing for the GFP and 1 case missing for intelligence; Sample 2 had 0 cases missing for the GFP and 10 cases missing for intelligence. The initial analyses were run without imputing missing data. Subsequent to the initial analyses we imputed the data and reran the analysis with the unit weighted GFP.

Missing data was imputed using the following steps. In both samples missing data analysis revealed no significant patterns of missingness allowing the analyses to be imputed (Schlomer, Bauman, & Card, 2010). We chose to use Full Information Maximum Likelihood (FIML) in PROC CALIS to estimate the relationship between the unit weighted GFP and intelligence. FIML estimation is best used when missing data is present in the predictor than in the outcome variable (Allison, 2012). Because of this, we used the variable with missingness as a predictor in the analyses for both samples.

The bivariate correlations between the GFPs and *g* for Sample 1 were as follows: unit weighted, $r(168) = 0.30$, $p < 0.001$; unit weighted sans openness and conscientiousness, $r(168) = 0.23$, $p < 0.01$; meta-analytic weighted, $r(168) = 0.32$, $p < 0.001$. The bivariate correlations between the GFPs and *g* for Sample 2 were as follows: unit weighted, $r(141) = 0.38$, $p < 0.001$; unit weighted sans openness and conscientiousness, $r(141) = 0.26$, $p < 0.01$; meta-analytic weighted, $r(141) = 0.40$, $p < 0.001$. Imputing the data resulted in little change. For Sample 1 the unit weighted GFP-*g* correlation went from $r = 0.30$ to $r = 0.31$. For Sample 2, imputing the data did not change the correlation.

Given the differences between the two samples and the Block and Block (2006) data, although the magnitude of the correlations is slightly smaller they are still in-line with the range of correlations found by Dunkel (2013). For example, in comparison to Sample 1, the Block and Block (2006) data included measures of *g* using the extensive Wechsler tests of IQ and multiple trained raters utilizing more extensive information upon which to base their judgments. If the Raven's Matrices scores in the Block and Block (2006) data are examined instead of the more comprehensive Wechsler tests, the correlation between cognitive ability and the GFP at age seven (the same age as in the Longitudinal Study of Icelandic Children) is $r = 0.34$ (Dunkel, 2013); which is very similar in magnitude to what was found in the current analysis. Additionally, in comparison to Sample 2 the Block and Block (2006) data utilized the full CCQ. Also as pointed out by an anonymous reviewer, the relationship between observable variables may result in a downward bias. Lastly, similar results were found by Wilson, Schalet, Hicks, and Zucker (2013). When Wilson et al. (2013) used cluster analysis on the CCQ items they found, in a sample of three to five year-olds rated by trained clinical graduate students, that scores on the first identified cluster of items correlated with IQ scores at $r = 0.47$.

In summary, the results support the hypothesis that a Big Five-based GFP based on independent rater's judgments using the CCQ are positively correlated with *g*. Research shows that rater based measures of personality are superior to self-reports (Connelly & Ones, 2010; Dunkel, Stolarski, Van der Linden, & Fernandes, 2014) which suggests that the difference between GFPs that are correlated with *g* and those that are not is due to who is making the personality judgment. However, there are also GFPs based on other self-report personality measures, such as the California Psychological Inventory, that seem to exhibit stronger correlations with *g* than Big Five-based GFPs (e.g., Dunkel, Van der Linden, Beaver, & Woodley, 2014; Loehlin et al., 2015; Van der Linden, Dunkel, Beaver, & Louwen, 2014). Thus even though GFPs based on separate measures show convergence (e.g., Loehlin, 2012; Woods & Hardy, 2012) their association with *g* is dissimilar. It is also worth noting that the original study (Dunkel, 2013) and the two samples used to test for replication used children. The results could differ for adults.

Thus, it may be worthwhile for future research to try and ascertain why some GFPs correlate with *g* while others do not. Both a meta-analysis of existing studies and initiating research using both self-reports and ratings along with measures of general cognitive ability would be informative.

Acknowledgments

We would like to thank Jens B. Asendorpf for sharing data from the Munich Longitudinal Study on the Genesis of Individual Competencies. We would like to thank Volker Hofmann for sharing the data from Longitudinal Study of Icelandic Children.

References

Allison, P. D. (2012). Handling missing data by maximum likelihood. *SAS global forum, 312*, 1–21.

Asendorpf, J. B., & Van Aken, M. A. G. (2003). Validity of Big Five personality judgments in childhood: A 9 year longitudinal study. *European Journal of Personality, 17*, 1–17.

Asendorpf, J. B., Conner, M., de Fruyt, F., de Houwer, J., Denissen, J. J. A., Fiedler, K., ... Wicherts, J. M. (2013). Recommendations for increasing replicability in psychology. *European Journal of Personality, 27*, 108–119.

Block, J. (1978). *The Q-sort method in personality assessment and psychiatric research.* Palo Alto, CA: Consulting Psychologists Press (Originally published in 1961).

Block, J., & Block, J. H. (2006). Venturing a 30-year longitudinal study. *American Psychologist, 61*, 315–327.