Routledge
Taylor & Francis Group

Journal of Personality Assessment

ISSN: 0022-3891 (Print) 1532-7752 (Online) Journal homepage: https://www.tandfonline.com/loi/hjpa20

Development of a Short Form of the Abridged Big Five-Dimensional Circumplex Model to Aid with the Organization of Personality Traits

Meredith A. Bucher & Douglas B. Samuel

To cite this article: Meredith A. Bucher & Douglas B. Samuel (2019) Development of a Short Form of the Abridged Big Five-Dimensional Circumplex Model to Aid with the Organization of Personality Traits, Journal of Personality Assessment, 101:1, 16-24, DOI: 10.1080/00223891.2017.1413382

To link to this article: https://doi.org/10.1080/00223891.2017.1413382

JOURNAL OF PERSONALITY ASSESSMENT
2019, VOL. 101, NO. 1, 16–24
https://doi.org/10.1080/00223891.2017.1413382

Routledge
Taylor & Francis Group

Development of a Short Form of the Abridged Big Five-Dimensional Circumplex Model to Aid with the Organization of Personality Traits

Meredith A. Bucher and Douglas B. Samuel

Department of Psychological Sciences, Purdue University

ABSTRACT

Although there has been widespread consensus on the use of the Five-Factor Model (FFM) of general personality functioning in personality research, there are various, diverse models of the lower order traits of the FFM domains. Given the usefulness of these finer grained traits, it is imperative to integrate facets proposed across a variety of models and eventually reach consensus on the lower level traits of the FFM. Due to its depth and coverage, the Abridged Big Five-Dimensional Circumplex (AB5C) model potentially provides a useful framework for organizing various faceted models due to its conceptual organization and inclusiveness. The only measure of this model—the IPIP–AB5C—has shown promise, but is limited by its length (i.e., 485 items). This study developed an abbreviated version of the IPIP–AB5C using an iterative process including item response theory methods. The shorter version maintained key features of the long form including a factor structure that matched the full form as well as facets that correlated in expected ways with other FFM measures. Building on this support, the short form was used to contextualize and organize the facets from 2 commonly used measures.

ARTICLE HISTORY
Received 13 May 2017
Revised 3 November 2017

Personality affects all areas of functioning and is useful for predicting important outcomes and behavior patterns studied in essentially all areas of human behavior (Ozer & Benet-Martinez, 2006). Because of its predictive utility, researchers have developed a wide array of instruments that assess personality traits. Over the last few decades this research has coalesced around five broad domains that appear to provide a reasonably comprehensive framework for capturing individual differences in human personality functioning (John, Naumann, & Soto, 2008). These five constructs, which have been labeled the Big Five, or the Five-Factor Model (FFM), emerged from the lexical tradition. The domains are considered bipolar in the sense that they are relatively normally distributed within the population and standings at both ends of the trait dimensions are considered useful and informative. These domains are Extraversion versus Introversion, Agreeableness versus Antagonism, Conscientiousness versus Undependability, Neuroticism versus Emotional Stability, and Openness versus Closedness to Experience. Although criticisms of this model have been raised (Block, 1995) and alternatives exist (Lee & Ashton, 2004), the FFM has succeeded well in providing a common language for personality description across areas of psychology.

Empirical support for these five domains in terms of stability, heritability, and universality is extensive. The five factors have been largely replicated across different countries and cultures (Jang, McCrae, Angleitner, Riemann, & Livesley, 1998). Research has found support for the stability of the FFM across genders on both self- and observer reports (Terracciano, Costa, & McCrae, 2006) with gradual changes in trait consistency from childhood to adulthood that tend to plateau around age 50 to 70 (e.g., Roberts & DelVecchio, 2000). Behavioral genetic studies have also been conducted and provided support for the heritability of the personality domains and traits (Jang, Livesley, & Vernon, 1996). Additional research has also shown the FFM traits to not only be universal across different countries, but different cultures as well. Using the Revised NEO Personality Inventory (NEO PI–R), McCrae and Costa (1997) investigated six distinct language families and found support for the FFM suggesting the five-factor structure of personality extends to other languages and cultures outside of English-speaking, Western culture.

Although the broad domains have utility for many tasks, there are times when finer grained traits, or facets, can be useful. Researchers often use personality to predict specific behaviors, outcomes, and theories and, at times, the broad domains might obscure predictive relationships, as it can be difficult to determine which aspect of the domain accounts for the given covariance (Smith, McCarthy, & Zapolski, 2009). Although some have argued that the use of domains might be preferable when predicting a construct that is broad and complex (Ones & Viswesvaran, 1996), other studies have compared the predictive validity of the domains and the facets themselves and found that the facets tend to improve the prediction of specific outcomes better than the domains (e.g., Ashton, Paunonen, & Lee, 2014) and are useful for differentiating personality disorders (e.g., Reynolds & Clark, 2001).

CONTACT Meredith A. Bucher bucher5@purdue.edu Department of Psychological Sciences, Purdue University, 703 Third Street, West Lafayette, IN 47907.
Supplemental data for this article can be accessed on the publisher's website.

Because of the importance of lower order facets in terms of predictive utility, various facet models have been developed to specify those traits (Ziegler & Backstrom, 2016). However, there is no formalized or agreed on set of facets, resulting in a variety of models that do not converge. Early on, Costa and McCrae developed facets for their NEO PI–R (Costa & McCrae, 1992) where each domain had six corresponding lower order facets that were conceptually derived based on an inspection of relevant traits in the literature. The NEO PI–R enjoys wide use in research and clinical settings; thus, a great deal of information has accumulated on the relationship between specific facets and outcomes. However, a number of alternative facet arrangements exist.

For example, the HEXACO Personality Inventory–Revised (HEXACO PI–R; Lee & Ashton, 2004) offers one such alternative with four facets per domain as well as a single interstitial facet, labeled altruism. The HEXACO model does differ from the FFM at the domain level as it effectively splits off a dimension labeled Honesty-Humility from the domain of Agreeableness. Although far less commonly used than the NEO PI–R, the HEXACO PI–R has now been used in hundreds of studies itself and so represents a well-researched collection of facets. The Faceted Inventory of the Five-Factor Model (FI–FFM; Simms, 2009), which includes 26 facet scales, is another alternative. Additionally, the Big Five Inventory (BFI; John & Srivastava, 1999) is the most commonly used measure of the domains, but does not contain formal facet scales. However, the newly released BFI–2 does now contain three facets per domain (Soto & John, 2016).

What is needed within the field is to contrast these various faceted models and elucidate a consensus lower order structure. In doing so, it might be useful to employ a lens by which to compare the existing facets. Woods and Anderson (2016) recently argued that given its broad inclusiveness and conceptual delineation, the Abridged Big Five-Dimension Circumplex (AB5C) model (Hofstee, De Raad, & Goldberg, 1992) could provide a set of coordinates that organize existing facet scales toward a "periodic table of personality." The AB5C model is intriguing for this purpose given its inclusiveness—45 facets, the most of any model—and that it delineates the facets from a conceptual organization.

Specifically, the AB5C framework suggests that in addition to five facets that represent "pure" forms of each domain, there are 40 more facets with secondary loadings (negative or positive). Thus, for example, the facets of Extraversion reflect Extraversion with high Agreeableness (warmth), Extraversion with low Agreeableness (provocativeness), Extraversion with high Conscientiousness (assertiveness), and so on. In this way, all AB5C facets are organized along a two-dimensional space with bipolar axes. This circumplex organization stands in contrast to the simple structure of other faceted models, which indicate that each facet is associated with only a single domain. In reality, facets often have notable secondary and tertiary loadings (e.g., McCrae, Zonderman, Costa, Bond, & Paunonen, 1996). Some other models have acknowledged these secondary and tertiary loadings, such as the NEO PI with its style graphs, which represent a combination of traits to create "styles." In addition, Millon (1996) argued that different personality prototypes, both normal and abnormal, share personality traits that can be arranged into combinations he termed circulargrams. As such, Hofstee (2003) argued that the AB5C is better able to capture the relation between facets and factors by formally accounting for secondary loadings.

One limiting factor in employing the AB5C model in this fashion has been its measurement. Currently, there is no formal circumplex measure of the AB5C. However, using the lexical approach, Goldberg (1999) developed an instrument of the AB5C model with facets for each possible combination, allowing for secondary loadings. This instrument, the International Personality Item Pool AB5C (IPIP–AB5C), has been praised for its in-depth coverage of the FFM lower order structure (i.e., it possesses 45 facets; DeYoung, Quilty, & Peterson, 2007), yet there has been relatively little research on the measure itself.

Bäckström, Larsson, and Maddux (2009) were among the first to employ the IPIP–AB5C and reported that, semantically, the measure broadly appeared to comport with the AB5C prediction of a circumplex model. They did note, however, that certain facet names were more similar to the original AB5C model than others. Bäckström and colleagues also examined the structural validity of the IPIP–AB5C to determine how closely the facets matched the expected primary and secondary domain loadings. Using confirmatory factor analysis (CFA), they found that allowing secondary loadings resulted in a better fit than only allowing primary loadings. Overall, 44 out of 45 facets had primary loadings at or above the suggested .50, and 32 of 40 facets had their secondary loadings at or above the suggested .30. Overall, Bäckström and colleagues concluded that the "preliminary results are very promising, and we believe the AB5C model deserves renewed attention in trait psychology" (p. 462).

Using a Polish version of the IPIP–AB5C, Strus, Cieciuch, and Rowiński (2014) sought to extend Bäckström and colleagues' (2009) research to test the link between the IPIP–AB5C and other measures of the FFM. They compared the basic traits of the IPIP–AB5C to the traits of the NEO PI–R and IPIP version of the NEO PI–R (IPIP–NEO PI–R; Goldberg, 1999) and found strong convergent correlations at the domain levels (i.e., cross-instrument correlations ∼.70), whereas the highest discriminant correlation was only .35. Furthermore, they examined the hierarchical structure using second-order CFA and found strong loadings on the expected primary domain, with only four facets falling below .60 and all 45 facets above .50. In addition, 28 out of 40 facets also obtained secondary loadings on their specified domains at .30 or higher. Overall, the authors concluded that the IPIP–AB5C domains performed as markers of the FFM and generally were consistent with circumplex predictions of the AB5C model.

Thus, findings from both articles suggest that the AB5C model is a promising and broadly inclusive faceted model that could be useful for integrating other faceted measures. Interestingly, however, Woods and Anderson (2016) did not use the IPIP–AB5C itself to support their argument for the AB5C model. Instead, they extracted five orthogonal components from a 100-item adjective checklist to specify high and low poles of each domain within their sample. Although such a strategy has some appeal, the local specification of factors creates the possibility of idiosyncratic findings and limits the integration of findings across studies.

A possible explanation for the relative paucity of research on the AB5C is that the IPIP–AB5C has 485 items. From a practical standpoint, it is difficult to administer such a long measure in research and more applied settings, particularly along with other faceted inventories. However, a shortened version of the IPIP–AB5C that assesses the 45 facets more efficiently would allow greater refinement of the measure and facilitate comparison with other models.

This study reports the development of a short form of the IPIP–AB5C using item–response theory (IRT) analyses (Embretson & Reise, 2000) as well as empirical criterion keying. We sought to identify candidate items to abbreviate the 45 IPIP–AB5C subscales based on unidimensionality and their relation with the NEO PI–R. The retained items were then administered to a new sample to make final item selections and test the short form's structure and construct validity compared to the full-length IPIP–AB5C (i.e., Smith, McCarthy, & Anderson, 2000).

Study 1

Method

Participants and procedure

Initial sample. The sample in the first study consisted of an archival database of 501 participants from the Eugene-Springfield Community Sample (ESCS). When initially recruited, the sample ranged in age from 18 to 85 and was primarily White (98.4%; see Goldberg, 2008, for full details). This sample was used in the original creation of the IPIP–AB5C described in Goldberg (1999) and Goldberg et al. (2006).

Measures. The IPIP–AB5C (Goldberg et al., 2006) consists of 485 items drawn from the IPIP that measure the five domains (Extraversion, Agreeableness, Conscientiousness, Stability, and Intellect) as well as 45 facets (nine per domain). One facet example is friendliness, which is conceptualized as high Extraversion and high Agreeableness (E+A+). Participants indicate answers on a 5-point Likert scale ranging from 1 = strongly disagree; 5 = strongly agree. Cronbach's alpha coefficients in this sample ranged from $\alpha = .66$ (Sociability) to .86 (Stability).

The NEO PI–R is a 240-item self-report measure that assesses the FFM domains and six lower order facets for each domain. In this sample, internal consistency of the facet scales ranged from $\alpha = .71$ (activity level and dutifulness) to .95 (anxiety).

Data analytic procedures

Item response theory. Analyses were conducted within Mplus Version 7.31 using default settings (e.g., weighted least squares [WLS] estimator). The scales on the IPIP–AB5C range from 7 to 11 items and our goal was to identify at least 4 items per scale that would serve as candidates for inclusion on the short form. First, however, items were iteratively removed from the subscales to obtain the fidelity of the constructs and essential unidimensionality, with the goal of comparative fit index (CFI) being > .90 (Hu & Bentler, 1999), but preferably above .95. Items removed for each facet ranged from zero (understanding, happiness) to 6 (nurturance), with a mean of 2 items removed. Overall, the CFIs ranged from .90 (provocativeness, pleasantness, purposefulness) to .97 (imperturbability), with a mean of .93. After obtaining unidimensionality, IRT analyses were run on each facet of the IPIP–AB5C. Because the item responses are polytomous, ordered categorical responses, Samejima's graded response model was used (Samejima, 1969). Item factor loadings, as well as the beta parameters, or item "difficulty," or extremity were examined to identify items that would be preliminarily retained. In addition, items were correlated with the NEO PI–R domains and, in cases where item removal was unclear based on item factor loadings or intraclass correlation coefficients, these correlations were used to select those with the best convergent and discriminant validity. This process resulted in 238 candidate items (four to seven per facet) that were then administered to a separate sample of undergraduates. A supplemental spreadsheet that lists each IPIP–AB5C item remaining after obtaining unidimensionality and the 238 candidate items that were ultimately administered to the second sample is available.

Study 2

Method

Participants and procedure

The 238 candidate items were administered to 497 undergraduates recruited from the research pool at a Midwestern university. Four individuals consented, but did not complete participation. Eighty-three were removed because they endorsed at least two items on the Too Good scale ($n = 25$) or at least one Suspect item ($n = 60$) from the Personality Diagnostic Questionnaire for the *DSM–IV* (PDQ–4; Hyler, 1994). The remaining sample consisted of 410 participants, 49.0% of whom identified as male. Seventy-eight percent identified as White, 22.0% Asian, 4.0% African American, and 1.5% as another ethnicity. Mean age was 19.5 years. These participants were randomly split into derivation and validation samples. Both groups consisted of 205 participants and there were no significant differences between the groups in terms of gender, $\chi^2(2) = 1.03$, $p = .60$; ethnicity, $\chi^2(4) = 3.57$, $p = .47$; or age, $\chi^2(8) = 8.64$, $p = .37$.

Additional measures. The HEXACO PI–R (Lee & Ashton, 2004) consists of 100 self-report items rated on a 5-point scale (1 = strongly disagree, 5 = strongly agree). The HEXACO PI–R measures 25 facets across the six domains of Honesty-Humility (H), Emotionality (E), eXtraversion (X), Agreeableness (A), Conscientiousness (C), and Openness to Experience (O). Coefficient alphas ranged from .44 (unconventionality) to .77 (greed avoidance and creativity) in the derivation sample and from .50 (unconventionality) to .80 (patience) in the validation sample.

The IPIP–120 (Maples, Guan, Carter, & Miller, 2014) is a 120-item self-report measure that assesses the five broad domains of the FFM, with six lower order facets per domain. The publicly available measure was shortened from the original IPIP–NEO PI–R developed by Goldberg (1999). Alphas in the derivation sample ranged from .58 (immoderation) to .84

(depression and gregariousness). In the validation sample, alphas ranged from .62 (morality) to .87 (gregariousness).

Data analytic procedures

Using the derivation subsample, we abbreviated the candidate items into the final short-form scale based on a number of factors. First, we decided a priori that the shortened scales would have at least three items to allow latent variable analysis, but based the decision on retaining three versus four items on the performance of the items. It became clear that any additional psychometric information from the fourth items was not commensurate to the efficiency cost, so all scales were shortened to three items. As a first step, we prioritized items that had intercorrelations above .2, but below .6 (Clark & Watson, 1995). Next, we correlated the candidate items with the IPIP–120 and HEXACO PI–R and selected those that most closely matched the hypothesized links with the primary and secondary domains. In cases where a facet from another measure was ostensibly similar (e.g., IPIP–AB5C gregariousness and IPIP–120 gregariousness), we also investigated the correlation of the candidate items with that scale. Based on these procedures, we selected a final set of three items for each of the 45 scales, resulting in an abbreviated version of the IPIP–AB5C, with 135 items.

Using the validation subsample, we then examined convergent and discriminant validity of the short-form facet scores with the IPIP–120 and HEXACO PI–R to determine how the nomological network of the original IPIP–AB5C was preserved with the short form. Additionally, factor congruence was examined to confirm that the short form's scales related to one another in the same manner as the long scales.

After establishing reliability and validity, we used the short form of the IPIP–AB5C to investigate the relationship between the facets on the IPIP–AB5C and those from the IPIP–120 and HEXACO PI–R. This was done as an example of one way to compare and integrate existing facets across facets in different models in a "periodic table" fashion. It can be argued that AB5C measures are a more rigorous test for this, as other FFM instruments do not have specific hypotheses regarding cross-loadings.

Results

Reliability of the facets of the short form of the IPIP–AB5C ranged from .36 (introspection) to .84 (talkativeness) in the derivation sample and .43 (introspection) to .85 (talkativeness) in the validation sample. A supplemental table including all Cronbach's alphas of each facet on the short form of the IPIP–AB5C is available.

Factor analysis

Separate factor analyses were conducted in *Mplus* using WLS with oblimin rotation with the full-length IPIP–AB5C from the ESCS data as well as the newly created short form in the validation sample (Table 1). A supplemental table including the short form's model fit information is available. Tucker's congruence coefficient (Tucker, 1951) was used to compute similarity between the long and short form. All factors appeared to have good congruence (φ = .92–.94), except for Agreeableness, which obtained borderline congruence (φ = .87). Facets with the largest factor differences on this domain were provocativeness, pleasantness, and creativity. Of these three, pleasantness's factor loading improved on the short form, whereas provocativeness and creativity's loading on the Agreeableness factor decreased. To further investigate the fidelity of these three facets on the short form we correlated the items we retained on the short form with the remainder of the long-form items using the ESCS data set. The correlations of the short form with the summed remainder of items for each scale were .53 (provocativeness), .54 (pleasantness), and .67 (creativity). This suggests that, overall, the items chosen for the short form do correlate reasonably with the items that were not retained.

Table 1. Factor loadings for the short form of the IPIP–AB5C facets in the validation sample.

Facet	E	A	C	S	I	
Gregariousness	**.86**	−.04	−.05	−.05	−.07	Y
Friendliness	**.66**	.34	.04	.02	−.01	Y
Assertiveness	**.42**	−.19	.26	.05	.41	N_{ab}
Poise	**.76**	.06	−.11	.19	.06	N_b
Leadership	**.61**	.14	.12	−.05	.25	N_b
Provocativeness	**.55**	−.14	−.12	.09	.39	N_b
Self-disclosure	**.29**	.23	−.22	.00	.24	N_{ab}
Talkativeness	**.61**	−.11	−.05	−.26	.12	N_b
Sociability	**.68**	.04	.02	−.07	−.25	N_b
Understanding	.07	**.63**	.11	−.14	.14	Y
Warmth	.44	**.49**	.07	−.01	.19	Y
Morality	−.06	**.23**	.58	.02	−.02	N_a
Pleasantness	−.01	**.59**	.17	.14	−.02	N_b
Empathy	.23	**.40**	.22	−.09	.35	N_a
Cooperation	−.25	**.55**	.17	.05	−.18	N_b
Sympathy	.21	**.66**	.07	−.16	.10	N_b
Tenderness	.21	**.50**	−.02	−.38	.12	Y
Nurturance	−.01	**.69**	.12	.00	−.18	N_b
Conscientiousness	−.04	.06	**.82**	−.06	.09	Y
Efficiency	.16	.01	**.75**	.05	−.10	N_b
Dutifulness	−.26	.29	**.61**	.01	−.09	N_b
Purposefulness	.15	.07	**.69**	.14	.24	N_b
Organization	.03	−.01	**.42**	.07	.52	N_a
Cautiousness	−.31	−.03	**.69**	.01	−.06	Y
Rationality	.10	−.37	**.25**	−.21	−.07	N_a
Perfectionism	.03	−.14	**.56**	−.30	.28	Y
Orderliness	−.12	−.03	**.71**	.00	−.02	N_b
Stability	.07	.13	−.07	**.79**	.06	Y
Happiness	.41	.10	.24	**.53**	−.11	Y
Calmness	−.07	.58	−.07	**.49**	.02	Y
Moderation	.14	.13	.59	**.28**	−.14	N_a
Toughness	.02	.12	.03	**.77**	.20	N_b
Impulse control	−.40	.34	.24	**.34**	−.11	N_a
Imperturbability	−.08	−.25	−.05	**.78**	.09	N_b
Cool-headedness	−.00	.14	−.58	**.27**	−.10	N_a
Tranquility	−.07	−.28	.08	**.74**	−.08	N_b
Intellect	−.04	.00	.00	.04	**.63**	Y
Ingenuity	.25	−.05	.01	.12	**.52**	N_b
Reflection	.07	.55	−.03	−.24	**.27**	N_a
Competence	.14	−.04	.25	.24	**.58**	Y
Quickness	.15	−.08	.18	.23	**.58**	N_b
Introspection	−.34	.03	−.24	−.17	**.48**	N_{ab}
Creativity	−.10	.13	−.05	.16	**.62**	N_b
Imagination	−.05	.25	−.05	−.12	**.51**	N_{ab}
Depth	−.09	.25	−.02	−.20	**.54**	N_{ab}
Congruence	.94	.87	.92	.93	.93	

Note. Factor loadings shown in bold are loadings for the facets' primary domain; underlined coefficients indicate a facet's secondary domain. IPIP–AB5C = International Personality Item Pool AB5C; E = Extraversion; A = Agreeableness; C = Conscientiousness; S = Stability; I = Intellect. Congruence indicates the factor congruence between the original IPIP–AB5C form and IPIP–AB5C short form. The last column indicates whether the facet performed as would be expected on its primary and secondary loading. N_a = the facet failed to have a high enough primary loading (.50); N_b = the facet failed to have a high enough secondary loading (.30); N_{ab} = the facet failed to have a high enough primary and secondary loading.

Additionally, the facets of the short form were examined to see which were consistent with their expected facet loadings. Of all 45 facets, 32 met the suggested primary loading of .50 or higher, and only 20 facets met the suggested secondary loading of |.30| or higher. However, 34 of 45 facets had secondary loadings of |.20| or higher.

Convergent validity and discriminant validity

Convergent correlations between the short form's facets and their respective IPIP–120 domains were examined (Table 2). It is important to note that some IPIP–AB5C and IPIP–120 scales have overlapping items, which are indicated in the tables. The absolute median correlations for each facet scale with their primary domain counterpart ranged from .01 (rationality) to .80 (purposefulness), with a median correlation of .53 across all 45 facets. In total, 28 of the 45 (62%) facets were greater than |.50|, and a total of 80% of facets were |.40| or higher, suggesting strong correspondence with the hypothesized relations. These findings are highly congruent to the long form of the ECSC data set in which 89% of facets correlated with their primary domain > |.40|.

Of the remaining nine facets with values smaller than |.40|, five were from Openness to Experience, suggesting that, whereas the IPIP–AB5C short form's facets from Conscientiousness, Extraversion, Agreeableness, and Stability matched up well with their respective IPIP–120 primary domains (i.e., median correlations > |.50|), Openness to Experience did not. In fact, the median correlation of short form's Intellect facets with the IPIP–120 domain of Openness was only .33, suggesting some systematic difference in the conceptualization of those domains across the two instruments. The remaining IPIP–AB5C short-form facets that failed to obtain substantial correlations with their primary domain on the IPIP–120 were rationality (.01), cool-headedness (–.09), competence (.10), and quickness (.15).

Correlations were also examined between the short form's facets and their assigned secondary domain as assessed by the IPIP–120. These median correlations of the facets with each secondary domain ranged from .01 (tenderness) to .63 (moderation), with a median of .26 across 40 facets. These values are similar to correlations seen in the original long form and NEO PI–R in the ESCS (.29). Of the 40 facets with cross-loadings (i.e., not including those five "pure" domain facets), 16 (40%) had correlations with their secondary domain at or above |.30| and 52% had correlations at or above |.20|. IPIP–AB5C short-form facets that failed to obtain substantial correlations with their secondary domain included provocativeness (.02), self-disclosure (–.03), talkativeness (.04), sociability (.02), tenderness (.01), organization (.08), toughness (–.05), introspection (–.05), creativity (.03), and depth (–.02). Discriminant validity correlations (i.e., correlations with all other IPIP–120 domains besides primary and secondary) ranged from .03 (cooperation) to .44 (empathy) with an absolute median correlation of .17. This value was similar to the overall median of the IPIP–AB5C long form in the ESCS (.16).

The short form's facets were also correlated with the IPIP–120 and HEXACO PI–R facets to investigate how these facets organized two different facet models. Table 3 indicates with which IPIP–AB5C short-form facet the other facets correlated the highest. There are several ways to interpret Table 3: First, one can examine the conceptual matches between facets from the IPIP–AB5C short form and the HEXACO and IPIP–120. Those facets with similar names routinely affiliated, supporting the construct validity of the short form (e.g., AB5C assertiveness correlated with IPIP–120 assertiveness and HEXACO social boldness, AB5C gregariousness and IPIP–120 gregariousness, AB5C sympathy and IPIP–120 sympathy, and AB5C perfectionism and HEXACO perfectionism). Additionally, facets with different names but similar conceptualization also had

Table 2. Convergent validity with IPIP–AB5C facets and IPIP–120 domains.

	IPIP–120					
AB5C facet	E	A	C	N	O	*Mdn r* with other domains
Gregariousness$_a$	**.74**$_a$	.09	.00	–.19	.07	.08
Friendliness$_b$	**.66**$_b$	.43	.19	–.32	.17	.19
Assertiveness$_a$	**.61**$_a$	–.01	.41	–.38	.12	.12
Poise$_a$	**.75**$_a$	.19	.07	–.45$_a$	.12	.12
Leadership	**.65**	.24	.35	–.34	.27	.34
Provocativeness	**.63**	.02	.06	–.27	.14	.14
Self-disclosure	**.44**	.30	–.03	–.07	.20	.20
Talkativeness	**.50**	.05	–.04	.04	.21	.05
Sociability	**.48**	.16	.04	–.10	.02	.10
Understanding	.28	**.58**	.31	–.15	.30	.29
Warmth$_a$	.62	**.59**$_a$	.32	–.34	.25	.32
Morality	.09	**.26**	.55	–.20	–.13	.13
Pleasantness$_a$	.23	**.58**$_a$	.32	–.29	.17	.23
Empathy	.54	**.40**	.44	–.32	.35	.44
Cooperation$_a$	–.13	**.50**$_a$	.24	–.03	.03	.03
Sympathy$_a$	.46	**.72**$_a$	.27	–.16	.28	.28
Tenderness	.26	**.50**	.12	.01	.36	.26
Nurturance$_a$	.14	**.63**$_a$	.28	–.15	.14	.15
Conscientiousness	.17	.22	**.79**	–.22	–.08	.19
Efficiency$_b$	.24	.14	**.78**$_b$	–.36	–.10	.14
Dutifulness$_a$	–.08	.28	**.54**$_a$	–.14	–.11	.11
Purposefulness$_a$	.43	.23	**.80**$_a$	–.38	–.03	.23
Organization$_a$	.33	.09	**.53**$_a$	–.28	.08	.28
Cautiousness$_a$	–.24	–.05	**.59**$_a$	–.07	–.16	.07
Rationality	–.01	–.28	**.01**	.17	–.29	.17
Perfectionism	.24	.06	**.42**	.11	.05	.06
Orderliness$_b$	.05	.08	**.64**$_b$	–.15	–.24	.08
Stability$_a$	.14	.12	.21	**–.71**$_a$	–.11	.13
Happiness$_b$	.42	.18	.40	**–.75**$_b$	–.14	.18
Calmness$_b$	.10	.50	.18	**–.54**$_b$	.06	.10
Moderation	.18	.14	.63	**–.51**	–.14	.14
Toughness	.18	.09	.34	**–.72**	–.05	.18
Impulse control	–.23	.21	.30	**–.26**	–.14	.21
Imperturbability$_a$	–.04	–.23	.07	**–.50**	–.29$_a$	.07
Cool-headedness$_a$	–.12	–.09	–.32	**–.09**	.21$_a$	.12
Tranquility$_b$	–.09	–.23	.13	**–.46**	–.46$_b$	.13
Intellect	.24	–.04	.24	–.12	**.32**	.18
Ingenuity	.47	.03	.24	–.33	**.30**	.24
Reflection$_a$	.34	.54	.16	–.04	**.49**$_a$	.16
Competence	.47	.11	.51	–.42	**.10**	.42
Quickness	.38	.02	.44	–.37	**.15**	.38
Introspection	–.05	–.01	–.17	.19	**.33**	.17
Creativity$_b$	.22	.03	.27	–.27	**.49**$_b$	.27
Imagination$_c$	.23	.14	.19	–.10	**.71**$_c$	.14
Depth	.18	.20	.20	–.02	**.48**	.20
Median primary	.63	.58	.59	.51	.33	.17
Median secondary	.15	.28	.24	.37	.28	

Note. Coefficients shown in bold indicate a facet's primary domain; underlined coefficients indicate a facet's secondary domain. Median values are absolute. IPIP–AB5C = International Personality Item Pool AB5C; *Mdn r* = median correlation; $_a$ = one item overlapping; $_b$ = two items overlapping; $_c$ = three items overlapping. For the IPIP-120, E = Extraversion; A = Agreeableness; C = Conscientiousness; N = Neuroticism; O = Openness.

Table 3. Organization of IPIP–120 and HEXACO PI–R facets within the AB5C framework.

Gregariousness (E±E±)	Understanding (A±A±)	Conscientiousness (C±C±)	Stability (S±S±)	Intellect (I±I±)
IPIP Gregariousness$_a$ (.77)		HEX Organization (.59)	IPIP Anxiety$_a$ (–.69)	
IPIP Excitement-seeking (.42)			HEX Anxiety (–.48)	
Friendliness (E±A±)	**Warmth (A±E±)**	**Efficiency (C±E±)**	**Happiness (S±E±)**	**Ingenuity (I±E±)**
IPIP Friendliness$_b$ (.85)	IPIP Cheerfulness (.62)	IPIP Self-discipline (.93)	IPIP Depression$_b$ (–.93)	
			HEX Self-esteem (.72)	
			HEX Liveliness (.60)	
Assertiveness (E±C±)	**Morality (A±C±)**	**Dutifulness (C±A±)**	**Calmness (S±A±)**	**Reflection (I±A±)**
IPIP Assertiveness$_a$ (.86)	HEX Fairness (.42)	IPIP Morality (–.53)	IPIP Anger$_b$ (–.95)	
HEX Social boldness (.65)	IPIP Liberalism (–.35)		HEX Patience (.78)	
			HEX Forgivingness (.46)	
			IPIP Trust (.44)	
			HEX Flexibility (.39)	
Poise (E±S±)	**Pleasantness (A±S±)**	**Purposefulness (C±S±)**	**Moderation (S±C±)**	**Competence (I±C±)**
IPIP Self-consciousness$_a$ (–.68)	HEX Gentleness (.50)	IPIP Self-efficiency (.77)	IPIP Immoderation (–.38)	IPIP Activity level (.54)
HEX Sociability (.63)		IPIP Achievement-striving (.67)		
		HEX Diligence (.64)		
		IPIP Dutifulness (.62)		
Leadership (E±I±)	**Empathy (A±I±)**	**Organization (C±I±)**	**Toughness (S±I±)**	**Quickness (I±S±)**
			IPIP Vulnerability (–.59)	
Provocativeness (E±A–)	**Cooperation (A±E–)**	**Cautiousness (C±E–)**	**Impulse control (S±E–)**	**Introspection (I±E–)**
	IPIP Cooperation$_a$ (.75)	IPIP Cautiousness (.80)		IPIP Imagination (.49)
		HEX Prudence (.57)		
Self-disclosure (E±C–)	**Sympathy (A±C–)**	**Rationality (C±A–)**	**Imperturbability (S±A–)**	**Creativity (I±A–)**
	IPIP Altruism$_a$ (.79)	HEX Greed avoidance (–.32)	HEX Fearfulness (–.45)	IPIP Intellect$_b$ (.85)
	IPIP Sympathy (.70)	HEX Sincerity (–.26)	HEX Dependence (–.49)	
	HEX Altruism (.56)			
Talkativeness (E±S–)	**Tenderness (A±S–)**	**Perfectionism (C±S–)**	**Cool-headedness (S±C–)**	**Imagination (I±C–)**
	HEX Sentimentality (.62)	HEX Perfectionism (.61)	IPIP Adventurousness$_a$ (.51)	IPIP Artistic interest$_b$ (.88)
				HEX Creativity (.69)
				HEX Aesthetic appreciation (.66)
				HEX Unconventionality (.42)
				HEX Inquisitiveness (.38)
Sociability (E±I–)	**Nurturance (A±I–)**	**Orderliness (C±I–)**	**Tranquility (S±I–)**	**Depth (I±S–)**
	IPIP Modesty$_a$ (.61)	IPIP Orderliness$_a$ (.80)	IPIP Emotionality$_b$ (–.88)	
	HEX Modesty (.59)			

Note. IPIP = IPIP–120; HEX = HEXACO PI–R; $_a$ = one item overlapping; $_b$ = two items overlapping; $_c$ = three items overlapping with (IPIP–AB5C) short form facets. Each IPIP–120 and HEXACO PI–R facet is listed underneath the International Personality Item Pool AB5C (IPIP–AB5C) short form facet with which it correlates the highest. Each facet is only under one AB5C facet.

strong associations with one another, such as AB5C efficiency and self-discipline as well as AB5C happiness and HEXACO liveliness.

There were, however, some facets that had their highest association with AB5C facets that were not expected. For example, the HEXACO PI–R facet of sincerity, which was expected to correlate highly with facets of Agreeableness, obtained its highest correlation with the short form's facet of rationality (C+A–). It was clear from the correlation with rationality (–.26) that HEXACO sincerity was not strongly associated with any of the IPIP–AB5C short-form facets, suggesting that perhaps sincerity is not well-captured by the AB5C. This was similar to what was found by Woods and Anderson (2016), who noted that the HEXACO PI–R facet of sincerity correlated weakly with the domains of Emotional Stability (.22) and Agreeableness (.10).

Similarly, the IPIP–120 facet adventurousness (O4), which was expected to correlate highly with a facet from IPIP–AB5C short-form Openness, obtained its highest correlation (.51) with the IPIP–AB5C short-form facet cool-headedness (S+C–). In contrast, Woods and Anderson (2016) found the NEO PI–R facet actions (the corresponding facet from the IPIP–120) did correlate most highly with the domains of high Openness (.32) and low Conscientiousness (–.22), which was more consistent with expectations.

Second, one can examine the AB5C facets and see that some are populated by several scales from the IPIP–120 and HEXACO, whereas others are vacant. This indicates that some AB5C facets are quite well represented on the other two inventories, whereas others might be relatively underrepresented. This was particularly apparent for the AB5C facets within the domain of Intellect/Openness. Five facets—including all four facets from the HEXACO PI–R domain of Openness—obtained their highest correlation with the IPIP–AB5C short-form facet of imagination. In contrast, the other eight AB5C facets were largely blank, attracting only four scales combined from the IPIP–120. Similarly, Woods and Anderson (2016) had many different facets within the same domain fall into the same location (e.g., NEO PI–R trust, straightforwardness, and altruism all fall into pleasantness).

Finally, Table 3 can be interpreted by the general magnitude of the relations. For example, HEXACO PI–R sincerity correlated most highly with the IPIP–AB5C short-form scale of rationality, but the magnitude was only –.26, suggesting that this scale was not strongly associated with any of the 45 AB5C facets. On the other hand, the IPIP–120 facet of self-discipline correlated most highly with the IPIP–AB5C short form efficiency, and the magnitude of that correlation (.93) reflects a very strong association between the two facets.

Discussion

The field has reached some consensus in that personality functioning can be well described by the five domains of the FFM. However, due to the heterogeneity of domain-level assessments and the incremental support facets provide in predicting outcomes, investigating facet-level assessments and optimally specifying lower order facets is imperative (Ziegler & Bäckström, 2016). We agree with Woods and Anderson (2016) that the AB5C model might provide a useful framework for comparing and integrating existing faceted models due to its depth and coverage. This does not suggest the 45 facets of the IPIP–AB5C should be adopted wholesale as the lower order structure of the FFM. Rather we believe its conceptual framework might aid in integrating current faceted models. A major impediment to its use for this purpose, though, is the length of its only measure, the IPIP–AB5C.

To remedy this limitation, this study reports on the development of an abbreviated short form of the IPIP–AB5C. Although we believe this short form has promise for its efficiency, it should be understood to have the flaws inherent to the full IPIP–AB5C. We then used newly collected data to examine the performance of this short form with specific interest in how its facets aligned with those from other existing inventories and models. This was done to not only examine the measure's validity, but to set the stage for its use as a lens through which to compare other inventories. In this study, we did so by examining how the AB5C facets overlapped with two existing faceted inventories that have been heavily studied (e.g., the IPIP–120 and the HEXACO PI–R).

Validity of the short form of the IPIP–AB5C

Factor congruence between the long form of the IPIP–AB5C from the original sample and the short form in our validation sample were generally good, supporting the equivalency of the factor structure on these two measures. As with any measure of the FFM, the hierarchical structure is a crucial property so these results are helpful in demonstrating that the short form retains a key feature of the parent measure with only 28% of the items, resulting in significant time savings.

The convergent validity with the short-form facets and IPIP–120 primary domains was also good, although some variability across domains was apparent, particularly with Openness to Experience. The variability across Openness is not necessarily surprising, as this domain has long been a source of some inconsistency across measures (Woo et al., 2014). Specifically, whereas the lexical approach often calls this fifth factor Intellect (Goldberg, 1993), measures of the FFM, such as the NEO PI–R, conceptualize the domain as Openness to Experience. Although moderately correlated, these two constructs emphasize somewhat different aspects of the overarching domain and have nomological networks that diverge in important ways (DeYoung, Grazioplene, & Peterson, 2012).

When looking at specific facets' convergent validity with their primary domains, it was apparent that most lined up in expected ways. Some facets on the short form, though, did not correlate highly with their corresponding domain. For example, the facet of rationality (C+A–) performed poorly overall. It did not correlate strongly with any domain, and it appeared to function more like a marker of sympathy than logic, as it was more linked with Agreeableness and Openness from the IPIP–120. This was not seen in the long form from the ESCS data set, suggesting that item selection for the short form resulted in poorer convergence with similar Conscientiousness constructs. Alternatively, whereas the facet cool-headedness (S+C–) did not correlate strongly with the domain of Neuroticism but rather its secondary domain, Conscientiousness, a similar pattern was seen with the original IPIP–AB5C from the ESCS data, in which cool-headedness had poor primary correlations with the NEO PI–R domain Neuroticism. Thus, this particular facet might benefit from item revisions for a future short form. Overall, though, there was a pattern of strong correlations between the short form's AB5C facets and the primary domain from the IPIP–120.

The convergent validity of the IPIP–AB5C short-form facets with their secondary domains from the IPIP–120 was also in the predicted direction and roughly half the size of the primary domain correlations. Similar to the primary domains, there were also certain facets that did not correlate with their secondary domain as would be expected. For example, although provocativeness (E+A–) correlated well with the IPIP–120 Extraversion domain, it failed to correlate strongly with its secondary domain, Agreeableness. Rather, its highest secondary correlation was with the IPIP–120 domain Neuroticism. This pattern was also seen on the Intellect facets introspection (I+E–) and creativity (I+A–) that failed to obtain substantial correlations with their expected secondary domain. However, this was not seen in the ESCS data, suggesting this might have been a result of item selection or differences in sample population.

Other facets, such as self-disclosure (E+C–), talkativeness (E+S–), sociability (E+I–), tenderness (A+S–), organization (C+I+), toughness (S+I+), and depth (I+S–) had substantially lower correlations with their secondary domains than would be expected and this was seen in the ESCS data. Although some of these facets might benefit from item revision to improve the expected correlations, such as self-disclosure, organization, and toughness, other facets might improve on reconceptualization of the overall facet. For example, although the facet describing high Intellect and low Agreeableness is labeled creativity, it is unclear if this is really the ideal name or concept or if it should correlate with other measures of creativity. It is also important to note that in some cases low correlations might be due to the differences in conceptualization of specific traits among the AB5C and NEO. Thus, it might not be expected that all facets of the AB5C correlate strongly with expected facets on the IPIP NEO or NEO PI–R.

The discriminant validity of IPIP–AB5C short-form facets—with respect to the IPIP–120 domains—was also reasonable, although there were several instances where a given short-form facet correlated more highly with a discriminant domain than the secondary domain suggesting a reasonable degree of specificity.

Using the AB5C to compare alternative facet models

We then investigated how the AB5C facets of the short form compared with those from other personality inventories. Overall, it appeared that the short form of the IPIP–AB5C, HEXACO PI–R, and IPIP–120 facets bear some conceptual similarities. In most cases, the facets with similar names across measures tended to have their strongest associations with each other. There were, however, some facets that appeared to have their highest association with AB5C facets that were not expected. For example, the HEXACO PI–R facet of sincerity, which would be expected to correlate highly with facets of Agreeableness, obtained its highest correlation with the IPIP–AB5C short form's facet of rationality (C+A–), although it was a rather weak association. It was clear that HEXACO sincerity was not strongly associated with any of the AB5C facets, suggesting that perhaps sincerity is not well-captured by the AB5C. This was similar to what was found by Woods and Anderson (2016), suggesting that further research that examines the HEXACO sincerity scale as well as how it fits into the AB5C framework would be helpful.

A larger trend within Table 3 was that in some cases, multiple IPIP–120 and HEXACO PI–R facets affiliated most strongly with the same facet from the short form of the IPIP–AB5C. In contrast, there were other AB5C facet cells in Table 3 that were empty, indicating that there was no HEXACO or IPIP–120 facet that primarily affiliated with it. This pattern was observed most clearly in the Intellect/Openness domain. These results across both studies might suggest that the AB5C facets, despite being more plentiful, are not necessarily the lowest level of the FFM structure. In other words, to the extent that traits such as trust and straightforwardness are indeed distinct from each other, this would indicate that this distinction is not reflected in the conceptual facets of the AB5C. Alternatively, this might also suggest that some facets, such as trust and straightforwardness, are conceptually similar enough that they might not need separating on the NEO.

These findings could reflect the need to further investigate the coverage and measurement precision of the short form of the IPIP–AB5C and NEO scales. It is possible that certain IPIP–AB5C scales are too broad as operationalized, and thus capture more variance across the facets than would expected. On the other hand, some NEO scales might not be as dissimilar from each other as conceptualized. Second, it might simply be a case that some of the IPIP–AB5C short-form scales are more reliable. Test–retest dependability would be quite helpful for arbitrating the latter possibility and we agree with Ziegler and Backstrom (2016) that bifactor approaches have great capacity to inform on the amount of variance unique to each facet scale. These will be key areas for future work on the AB5C, but also illustrate the potential value of the AB5C as a contextual framework for integrating and understanding these findings.

Relatedly, past research has shown that certain facets of the long form of the AB5C might have weaknesses. Specifically, using the Swedish version of the IPIP–AB5C, Bäckström, Larsson, and Maddux (2009) found low factor loadings on quickness, creativity, tranquility, nurturance, toughness, and orderliness, all of which have Intellect as a primary or secondary domain. In addition, Strus, Cieciuch, and Rowiński (2014) found that empathy did not have its highest loading on its primary domain, and quite a few facets did not have high enough primary or secondary loadings on their Polish version of the IPIP–AB5C. In this study, using the original data from the ESCS, we found poor primary loadings for pleasantness and reflection, although factor analysis using a new sample found that, on the short form, pleasantness no longer had a poor primary loading. The long form had weak secondary loadings for quite a few facets, but secondary loadings improved for calmness and ingenuity on the short form.

In addition to potential measurement issues on the IPIP–AB5C, Strus and colleagues also posited that some of Goldberg's definitions of certain facets might be problematic, particularly efficiency, sympathy, orderliness, creativity, and toughness. In this study, we also found issues with the conceptualization of self-disclosure, empathy, rationality, and coolheadedness. Further research is suggested to investigate these facets and determine the ideal conceptualization. This should be done in different ways depending on the specific facet. For example, some facets simply did not have items that were truly representative of their name. This was particularly true for the facet of self-disclosure, in which the items specifically focus on joking with and entertaining others.

Conclusions

This study sought to develop a short form of the IPIP–AB5C that could then be used as a metric for integrating lower level facets of the FFM. Organizing facets from multiple measures can aid researchers to conceptualize and organize these different measures, as well as compare how these facets relate to each other. With this understanding, one can then make inferences about how results can be replicated across different personality instruments. For example, it might be likely that the IPIP–AB5C facet efficiency will perform similar to the IPIP–120 facet self-discipline.

Although these results suggest that this short form holds promise as a comprehensive measure of the FFM, there are some limitations. Although the preliminary items were derived in a population with a diverse age range, this short form was derived in a college population that was primarily White. Future research should examine the short form's validity in samples with a greater range of age and ethnicity. This study was cross-sectional and is thus limited in the degree to which it can inform on the reliability of the IPIP–AB5C short form. It is particularly important to establish measurement reliability in measures with few items, so future research that examines the test–retest dependability of this measure over a brief (e.g., 2-week) period would provide valuable information.

Finally, the short form is just a short form of the IPIP–AB5C and it thus likely retains flaws present in the longer measure. Initial research has suggested the IPIP–AB5C might have areas

that can be improved on, and it is our hope that this short form will aid in efforts to examine and potentially improve the measure at the item, facet, and conceptual levels. Nonetheless, these results demonstrated that the short form performed comparably to the original form of the IPIP–AB5C with 28% of the items. Further, the findings with the short form exhibited the potential utility of the AB5C framework for organizing facets across various measures of personality.

ORCID

Meredith A. Bucher http://orcid.org/0000-0001-7279-8136

References

Ashton, M. C., Paunonen, S. V., & Lee, K. (2014). On the validity of narrow and broad personality traits: A response to Salgado, Moscoso, and Berges (2013). *Personality and Individual Differences*, *56*, 24–28.

Bäckström, M., Larsson, M. R., & Maddux, R. E. (2009). A structural validation of an inventory based on the Abridged Five Factor Circumplex Model (AB5C). *Journal of Personality Assessment*, *91*, 462–472.

Block, J. (1995). A contrarian view of the five-factor approach to personality description. *Psychological Bulletin*, *117*, 187–215.

Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment*, *7*, 309–319.

Costa, P. T., Jr., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO PI–R) and NEO Five-Factor Inventory (NEO–FFI) professional manual*. Odessa, FL: Psychological Assessment Resources.

DeYoung, C. G., Grazioplene, R. G., & Peterson, J. B. (2012). From madness to genius: The Openness/Intellect trait domain as a paradoxical simplex. *Journal of Research in Personality*, *46*, 63–78.

DeYoung, C. G., Quilty, L. C., & Peterson, J. B. (2007). Between facets and domains: 10 aspects of the Big Five. *Journal of Personality and Social Psychology*, *93*, 880–896.

Embretson, S. E., & Reise, S. P. (2000). *Item response theory for psychologists*. Mahwah, NJ: Erlbaum.

Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American Psychologist*, *48*, 26–34.

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

Goldberg, L. R. (2008). *The Eugene-Springfield community sample: Information available from the research participants* (ORI Technical Report No. 48). Eugene, OR: Oregon Research Institute.

Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. G. (2006). The International Personality Item Pool and the future of public-domain personality measures. *Journal of Research in Personality*, *40*, 84–96.

Hofstee, W. K. B. (2003). Structures of personality traits. In T. Millon & M. J. Lerner (Eds.), *Handbook of psychology: Vol. 5. Personality and social psychology* (pp. 231–254). Hoboken, NJ: Wiley.

Hofstee, W. K. B., De Raad, B., & Goldberg, L. R. (1992). Integration of the Big Five and circumplex approaches to trait structure. *Journal of Personality and Social Psychology*, *63*, 146–163.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1–55.

Hyler, S. E. (1994). *Personality Diagnostic Questionnaire–4*. New York, NY: New York State Psychiatric Institute.

Jang, K. L., Livesley, W. J., & Vernon, P. A. (1996). Heritability of the Big Five personality dimensions and their facets: A twin study. *Journal of Personality*, *64*, 577–591.

Jang, K. L., McCrae, R. R., Angleitner, A., Riemann, R., & Livesley, W. J. (1998). Heritability of facet-level traits in a cross-cultural twin sample: Support for a hierarchical model of personality. *Journal of Personality and Social Psychology*, *74*, 1556–1565.

John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative Big Five trait taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp. 114–158). New York, NY: Guilford.

John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (Vol. 2, pp. 102–138). New York, NY: Guilford.

Lee, K., & Ashton, M. C. (2004). Psychometric properties of the HEXACO personality inventory. *Multivariate Behavioral Research*, *39*, 329–358.

Maples, J. L., Guan, L., Carter, N. T., & Miller, J. D. (2014). A test of the International Personality Item Pool representation of the Revised NEO Personality Inventory and development of a 120-item IPIP-based measure of the Five Factor Model. *Psychological Assessment*, *26*, 1070–1084.

McCrae, R. R., & Costa, P. T. (1997). Personality trait structure as a human universal. *American Psychologist*, *52*, 509–516.

McCrae, R., Zonderman, A., Costa, P., Bond, M., & Paunonen, S. (1996). Evaluating replicability of factors in the Revised NEO Personality Inventory: Confirmatory factor analysis versus procrustes rotation. *Journal of Personality and Social Psychology*, *70*, 552–566.

Millon, T. (1996). *Disorders of personality: DSM–IV and beyond*. New York, NY: Wiley.

Ones, D. S., & Viswesvaran, C. (1996). Bandwidth-fidelity dilemma in personality measurement for personnel selection. *Journal of Organizational Behavior*, *17*, 609–626.

Ozer, D. J., & Benet-Martinez, V. (2006). Personality and the prediction of consequential outcomes. *Annual Review of Psychology*, *57*, 401–421.

Reynolds, S. K., & Clark, L. A. (2001). Predicting dimensions of personality disorder from domains and facets of the Five-Factor Model. *Journal of Personality*, *69*, 199–222.

Roberts, B. W., & DelVecchio, W. F. (2000). The rank-order consistency of personality traits from childhood to old age: A quantitative review of longitudinal studies. *Psychological Bulletin*, *126*, 3–25.

Samejima, F. (1969). Estimation of latent ability using a response pattern of graded scores. *Psychometrika Monograph*, *35*, No. 17, p. 139.

Simms, E. E. (2009). *Assessment of the facets of the Five Factor Model: Further development and validation of a new personality measure* (Unpublished doctoral dissertation). University of Iowa, Iowa City, IA.

Smith, G. T., McCarthy, D. M., & Anderson, K. G. (2000). On the sins of short-form development. *Psychological Assessment*, *12*, 102–111.

Smith, G. T., McCarthy, D. M., & Zapolski, T. C. B. (2009). On the value of homogeneous constructs for construct validation, theory testing, and the description of psychopathology. *Psychological Assessment*, *21*, 272–284.

Soto, C. J., & John, O. P. (2016). The next Big Five Inventory (BFI–2): Developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power. *Journal of Personality and Social Psychology*. Advance online publication. doi:10.1037/pspp0000096

Strus, W., Cieciuch, J., & Rowiński, T. (2014). Circumplex structure of personality traits measured with the IPIP-45AB5C questionnaire in Poland. *Personality and Individual Differences*, *71*, 77–82.

Terracciano, A., Costa, P. T., & McCrae, R. R. (2006). Personality plasticity after age 30. *Personality and Social Psychology Bulletin*, *32*, 999–1009.

Tucker, L. R. (1951). *A method for synthesis of factor analysis studies* (Personnel Research Section Report No. 984). Washington, DC: Department of the Army.

Woo, S. E., Chernyshenko, O. S., Longley, A., Zhang, Z. X., Chiu, C. Y., & Stark, S. E. (2014). Openness to Experience: Its lower level structure, measurement, and cross-cultural equivalence. *Journal of Personality Assessment*, *96*, 29–45.

Woods, S. A., & Anderson, N. R. (2016). Toward a periodic table of personality: Mapping personality scales between the Five-Factor Model and the circumplex model. *Journal of Applied Psychology*, *101*, 582–604.

Ziegler, M., & Bäckström, M. (2016). 50 facets of a trait—50 ways to mess up? *European Journal of Psychological Assessment*, *32*, 105–110.