Original Article

Recovering the HEXACO Personality Factors – and Psychoticism – From Variable Sets Assessing Normal and Abnormal Personality

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Abstract: We examined the joint factor structure of the 30 facets of the NEO Personality Inventory – Revised (NEO-PI-R; or the NEO-PI-3) with either (a) the 25 facets of the Personality Inventory for DSM-5 (PID-5) or (b) the 15 facets of the Schedule for Nonadaptive and Adaptive Personality (SNAP) plus several dissociation scales, using self-reports from participant samples of previous research. The NEO-PI-R[3]/PID-5 variable set produced seven factors that represented the HEXACO factor space plus a "psychoticism" dimension. The NEO-PI-R/SNAP/dissociation variable set produced a similar set of seven factors. The results indicate that even some questionnaire variable sets not constructed to measure the HEXACO factors can recover those personality dimensions. Researchers interested in integrating the domains of normal and abnormal personality are advised to adopt a model consisting of six HEXACO-like dimensions plus a dimension of psychotic tendency.

Keywords: HEXACO, psychoticism, dissociation, normal and abnormal personality

The HEXACO model of personality structure is based on the results of lexical studies of personality structure in various languages (see e.g., Ashton & Lee, 2007). In those investigations, researchers examine the factor structure of ratings of persons on a large set of familiar personality-descriptive adjectives in a given language. The value of such variable sets is that they can be taken as representative of the population of subjectively important personality characteristics (e.g., Ashton & Lee, 2005; Goldberg, 1981). Therefore, to the extent that a similar set of factors can be recovered from lexical studies as conducted in various languages, those factors can be considered the major dimensions of personality. The finding that a set of six – but no more than six – factors could be repeatedly obtained in such investigations (see e.g., Ashton et al., 2004; Lee & Ashton, 2008) was the basis for the HEXACO model of personality structure.

The HEXACO factors are named Honesty-Humility (H), Emotionality (E), Extraversion (X), Agreeableness (A), Conscientiousness (C), and Openness to Experience (O). These six dimensions have been operationalized in a self- and observer report questionnaire, the HEXACO Personality Inventory – Revised (HEXACO-PI-R; e.g., Lee & Ashton, 2018). Analyses of the items or of the facet-level scales of that questionnaire routinely recover the six HEXACO factors (e.g., Lee & Ashton, 2018), and this fact rules out the possibility that the emergence of the six factors of lexical studies is some artifact resulting from analyses of adjective-based personality ratings.

Beyond the basic findings from lexical studies of personality structure, there are also theoretical and practical arguments for the replacement of five-dimensional personality models and measures by their HEXACO counterparts. From a theoretical point of view, the HEXACO Honesty-Humility, Agreeableness, and Emotionality factors correspond to the tendencies to cooperate even when one could exploit another (H), to cooperate even when being exploited by another (A), and to invest in kin and personal survival (E). These theoretical interpretations have been supported by evidence from economic games and behavioral ethics tasks (in the case of H and A; see e.g., Heck, Thielmann, Moshagen, & Hilbig, 2018; Hilbig, Zettler,

Leist, & Heydasch, 2013; Hilbig, Thielmann, Klein, & Henninger, 2016; Thielmann, Hilbig, & Niedtfeld, 2014) and by patterns of sex differences (particularly in the case of E; see Lee & Ashton, 2018). From a practical point of view, the use of five-dimensional instead of HEXACO measures entails a large loss of variance – a fact that reflects in part the tendency for HEXACO scales to be less (not more) strongly intercorrelated than five-dimensional scales – with this missing variance being heavily implicated in a wide range of socially important traits and behaviors (e.g., Ashton & Lee, 2008).

DeYoung (2015, p. 36) suggested that "Questionnaire rather than lexical studies do not support the six-factor solution," but some recent findings suggest that the HEXACO structure can be recovered even from some personality questionnaire variable sets that were constructed without any attempt to produce that structure. For example, Ashton, Lee, De Vries, Hendrickse, and Born (2012) factor analyzed self-report responses from 378 persons on the 30 facet scales of the NEO Personality Inventory – 3 (NEO-PI-3; Costa & McCrae, 2010)[1] and the 25 facet scales of the Personality Inventory for DSM-5 (PID-5; Krueger, Derringer, Markon, Watson, & Skodol, 2012). The results showed a seven-factor solution in which six factors corresponded closely to the HEXACO dimensions, with two of those factors being rotated variants of Emotionality and Extraversion. The remaining factor of that solution was defined by many PID-5 scales, particularly those representing "psychoticism," and was substantially correlated with external markers of schizotypal or dissociative tendencies. Thus, the Ashton et al. (2012) results suggest that a suitably diverse collection of personality scales can indeed recover the HEXACO structure even when this was never intended.

Since the publication of the Ashton et al. (2012) article, the PID-5/NEO-PI-R[3] variable set has been examined in several other studies, including those of De Fruyt et al. (2013), Griffin and Samuel (2014), and Wright and Simms (2014). However, none of these have reported a seven-factor solution and therefore none have investigated whether the HEXACO-plus-psychoticism structure reported by Ashton et al. (2012) can be recovered in other datasets. But given the widespread use of this combined NEO/PID-5 variable set, it would seem that many researchers consider it to represent the domains of normal and abnormal personality reasonably well, and so it is of some interest to find out whether the HEXACO-plus-psychoticism structure reported by Ashton et al. (2012) can be recovered in those other datasets. One purpose of the present report is therefore to reanalyze those datasets so that their seven-factor solutions can be compared with those of Ashton et al. (2012).

Another broad variable set that has been examined in studies of normal and abnormal personality is that produced by combining the 30 NEO-PI-R facets with the 15 scales of the Schedule for Nonadaptive and Adaptive Personality (SNAP; Clark, 1993). A dataset based on the combined NEO-PI-R/SNAP variable set was factor analyzed by Markon, Krueger, and Watson (2005), and their report was cited by DeYoung (2015) in support of the claim that questionnaire-based studies do not recover the HEXACO factors. However, the analyses of Markon et al. also included broad factor-level scales from the Big Five Inventory (BFI) and the Eysenck Personality Questionnaire (EPQ). The inclusion of those additional broad marker variables could well influence the obtained factor solutions in such a way as to anchor those solutions around Big Five (and Eysenck model) factor axes. When Markon et al. rotated six factors, their obtained dimensions did not show a clear one-to-one correspondence to the HEXACO factors. However, if the combined NEO-PI-R/SNAP variable set were examined without these additional broad marker scales, it is more likely that a HEXACO-like structure would be obtained in varimax (or other simple-structure-seeking) solutions.

As compared with the PID-5, the SNAP contains a smaller proportion of scales assessing psychoticism. But the dataset of Markon et al. actually did include several scales assessing dissociative tendencies, which are strongly correlated with psychoticism. These variables were included in factor analyses reported by Watson, Clark, and Chmielewski (2008) for the same participant sample. They reported a six-factor solution that consisted of the Big Five dimensions (defined by the relevant NEO-PI-R facets and by the broad BFI scales) plus a dissociation dimension.

Taking these results together, we speculate that a seven-factor solution derived from a combined NEO-PI-R/SNAP variable set supplemented by the dissociation scales would include a dissociation factor in addition to variants of the HEXACO dimensions. Therefore, another purpose of the present report is to examine the factor structure of that variable set, to find out whether it would produce a seven-factor structure similar to that of the NEO-PI-R[3]/PID-5 variable set.

Such a seven-factor structure might be a useful basis for understanding personality pathology. One important feature of this structure is that a dimension of entitlement and exploitation (i.e., low Honesty-Humility) is separated from a dimension of anger, oppositionality, and resentment

[1] The NEO-PI-3 administered to the sample of Ashton et al. was in fact the "first half" form of the instrument, as recommended for use by McCrae and Costa (2007). The NEO-PI-3 is an updated version of the NEO Personality Inventory – Revised (NEO-PI-R; Costa & McCrae, 1992).

(low Agreeableness); this division corresponds to the distinction between the two forms of cooperative tendency described above.

Another dimension of this seven-factor structure captures shyness and joylessness (low Extraversion), whereas another captures emotional sensitivity versus insensitivity (high vs. low Emotionality). The opposite extremes of this latter dimension might both be potentially pathological, but a rotation of this Emotionality dimension with Extraversion gives two dimensions for each of which one pole is clearly more problematic (see Ashton et al., 2012): an "introverted emotionality" dimension (much like Neuroticism) defined by anxiety, vulnerability, and depressiveness, and an "unemotional introversion" dimension defined by interpersonal coldness and detachment.

Still another dimension captures disorganization, laziness, and impulsivity (low Conscientiousness), although the opposite pole of this dimension has also been suggested to involve a problematic predisposition toward obsessive or workaholic tendencies. A dimension capturing intellectual and imaginative versus conventional tendencies (Openness to Experience) is likely less relevant to personality pathology, but might underlie the development of rebellious versus authoritarian attitudes (see Ashton et al., 2012). Finally, a separate dimension of psychotic, dissociative, and/or schizotypal tendencies – not generally considered a dimension of normal personality variation – is also included. This dimension – for which the large majority of persons may show essentially a true zero level – may be difficult to assess via self-report without contamination from response styles such as the tendency to endorse undesirable, low-base-rate items. Although this latter dimension is roughly independent of Openness to Experience, some traits involving unusual thought processes might represent blends of the two dimensions (see Ashton & Lee, 2012; Ashton et al., 2012).

Study 1

Method

We report analyses of the NEO-PI-R[3] and PID-5 facets using data from three participant samples: those of De Fruyt et al. (2013), Griffin and Samuel (2014), and Wright and Simms (2014). The sample of De Fruyt et al. (2013) consisted of 240 Belgian university students (85% female, M_{age} = 19.8 years). The sample of Griffin and Samuel (2014) consisted of 336 US university students (60% female, M_{age} = 19.4 years). The sample of Wright and Simms (2014) consisted of 266 US adults who were a subsample of a larger sample of 628 US adults (64% female, M_{age} = 43.2 years) who had reported psychiatric treatment within the preceding 2 years; the subsample considered here consists of those participants who had completed the full NEO-PI-R and the PID-5.

In all three samples, the 220-item PID-5 and the 240-item NEO-PI-R/3 were administered with their usual self-report instructions. (The instruments used in De Fruyt et al., 2013, were authorized Dutch/Flemish translations of the original English-language instruments that were administered to the other samples considered here.) For details of the administration of these inventories, and any additional measures, see the original sources.

Results

For each of the three datasets, we extracted seven principal axis factors and then rotated them using an orthogonal Procrustes algorithm with the target matrix being the varimax-rotated loading matrix reported in Ashton et al. (2012, Table 4). Recall that the seven NEO-PI-3/PID-5 dimensions obtained by Ashton et al. (2012, Table 4) correlated strongly with a separate set of seven dimensions defined by the HEXACO-PI-R facets and by some dissociation scales: Six of the NEO-PI-3/PID-5 factors corresponded closely to the HEXACO factor space, and the seventh (psychoticism) was chiefly correlated with the dissociation dimension (see Ashton et al., 2012, Table 5).

To allow readers to inspect the correspondence between solutions, we have provided in Table 1 those three seven-factor solutions along with their factor congruence coefficients as computed against the seven dimensions reported by Ashton et al. (2012). As can be seen in the table, the two sets of dimensions are clearly highly similar, but with slightly lower similarity for the "psychoticism" factor, which tends to show positive loadings for all PID-5 scales. Apparently, the relative contributions of psychotic (i.e., schizotypal, or dissociative) variance, of response style variance, or of overall psychopathology variance differ somewhat across datasets (see Ashton, De Vries, & Lee, 2017, for a discussion of response styles in the PID-5). Nevertheless, the strong overall similarity of each of the three seven-component solutions to the seven-component solution of Ashton et al. (2012) is obvious.

Study 2

Method

The sample consisted of 327 introductory psychology students (65% female) from two US universities who provided self-reports on the NEO-PI-R, the SNAP, the BFI, the EPQ, and a series of dissociation scales. This dataset was

Table 1. Seven-factor solution from NEO-PI-R and PID-5 facet scales

Scale		E − X			X + E			−H			−C			−A			Psychoticism?			O		
		S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
PID	Anxiousness	**.74**	**.71**	**.74**	−.25	−.20	−.24	.07	.06	.05	.05	.05	.10	.15	.23	.26	.29	.26	.26	.04	.04	.05
NEO	Vulnerability	**.70**	**.69**	**.70**	−.19	−.09	−.24	−.15	−.02	−.04	.35	.34	**.44**	.14	.21	.19	−.01	.01	.09	−.08	−.08	−.04
NEO	Anxiety	**.75**	**.73**	**.79**	−.21	−.04	−.18	.02	−.20	−.01	.08	.02	.04	.09	.16	.14	.08	−.08	.03	.02	.01	.14
NEO	Depression	**.66**	**.60**	**.59**	−.34	−.29	−.31	−.14	−.10	−.24	.33	.18	.33	.11	.25	.25	.18	.21	.25	.05	.09	.02
NEO	Self-consciousness	**.58**	**.64**	**.64**	−.38	−.26	−.39	−.20	−.11	−.04	.14	.12	.28	−.04	.10	.16	.06	.03	.06	−.07	.11	.09
PID	Emotional lability	**.67**	**.69**	**.69**	.12	.01	−.10	.05	.16	.09	.10	.17	.25	.32	.20	.22	.16	.26	.34	.14	.05	.00
PID	Separation insecurity	**.61**	**.47**	**.56**	.19	−.03	.00	.03	.09	.22	.02	.09	.17	.07	.12	.15	.15	.37	.31	−.20	−.13	−.13
PID	Depressivity	**.55**	**.42**	**.49**	**−.48**	**−.45**	**−.43**	−.06	.13	−.03	.26	.28	**.41**	.08	.11	.14	.37	**.52**	.39	.05	.01	−.10
PID	Submissiveness	**.44**	.34	**.42**	.03	−.04	.02	.02	.01	.01	.14	.15	.25	−.30	−.12	−.22	.22	.22	.21	−.24	−.19	.01
NEO	Assertiveness	−.31	−.30	−.33	.38	**.46**	**.49**	.26	.28	.20	−.29	−.31	−.19	.29	.20	.22	−.01	.06	.11	.17	.03	.01
PID	Withdrawal	.08	.17	.20	**−.82**	**−.77**	**−.80**	.10	.22	.12	−.03	.15	.07	.06	.03	.11	.23	.24	.17	.16	.00	.08
NEO	Warmth	.03	.05	−.05	**.82**	**.80**	**.82**	−.04	−.11	−.17	−.12	−.08	−.12	−.20	−.27	−.22	.02	.07	−.03	.08	.14	.05
PID	Anhedonia	**.41**	.28	**.43**	**−.69**	**−.70**	**−.55**	.02	.17	−.14	.16	.12	.28	.12	.08	.12	.17	.31	.29	−.01	−.06	−.19
NEO	Gregariousness	−.06	−.05	−.16	**.75**	**.73**	**.75**	−.04	−.07	.08	.16	.02	.05	−.16	.03	−.07	−.01	.11	.10	−.28	−.15	−.14
NEO	Positive emotions	−.21	.01	−.26	**.72**	**.71**	**.65**	.12	−.08	.15	−.03	−.03	−.16	−.10	−.20	−.22	−.04	−.05	−.14	.13	.26	.24
PID	Restricted affectivity	−.34	−.24	−.30	**−.54**	**−.57**	**−.56**	.21	.21	.22	.14	.15	.15	−.17	.00	−.05	.38	.36	**.40**	−.08	−.11	−.06
PID	Intimacy avoidance	−.07	.07	−.07	**−.49**	−.36	**−.50**	.05	.20	.10	.10	.17	.10	−.22	−.11	−.11	.33	.34	.25	.05	−.01	−.01
NEO	Altruism	.17	.06	.03	**.49**	**.50**	.34	−.30	−.34	**−.60**	−.22	−.29	−.30	−.31	−.30	−.23	.08	.07	.00	.16	.24	.12
NEO	Activity	−.25	−.18	−.29	.36	**.52**	.38	.19	.11	.29	−.20	−.28	−.36	.08	.16	.12	.25	.24	.12	−.01	−.15	.06
NEO	Actions	**−.45**	−.31	**−.42**	.22	.23	.31	−.05	.00	−.12	.18	.22	.05	.03	−.03	−.05	.12	.14	.06	.34	.26	**.45**
PID	Risk taking	**−.46**	−.39	−.35	.27	.23	.08	.12	.22	.26	.36	.39	.31	.14	.32	.37	**.41**	.36	**.41**	.17	.04	.11
NEO	Excitement-seeking	−.31	−.20	−.28	**.53**	**.47**	**.41**	.14	.00	.25	.23	.13	.14	.01	.30	.35	.32	.20	.26	.18	.12	.12
PID	Deceitfulness	.10	.21	.07	.02	−.17	−.06	**.77**	**.73**	**.75**	.21	.27	.29	.13	.15	.12	.21	.26	.19	.00	.06	−.06
PID	Manipulativeness	.02	.04	−.01	.21	−.05	.10	**.71**	**.79**	**.72**	.05	.07	.10	.15	.13	.18	.19	.22	.28	.09	.03	.03
NEO	Straightforwardness	.06	−.04	.08	.01	.06	−.04	**−.71**	**−.67**	**−.71**	−.10	−.16	−.14	−.33	−.25	−.29	−.04	−.02	−.12	−.05	−.02	.02
PID	Callousness	−.19	−.03	−.07	−.31	−.37	−.34	**.65**	**.63**	**.60**	.14	.18	.16	.23	.21	.26	.22	.34	.29	−.21	−.13	−.14
PID	Attention seeking	.10	.10	.06	.22	.29	**.43**	**.59**	**.59**	**.59**	−.03	.17	.17	.04	.14	.12	.20	.35	.29	.05	.03	.02
PID	Grandiosity	−.07	.02	−.06	−.14	−.10	−.01	**.68**	**.72**	**.71**	−.15	−.01	−.07	.07	.09	−.03	.22	.26	.33	.02	−.01	.04
NEO	Modesty	.08	.13	.19	−.03	−.07	−.34	**−.66**	**−.65**	**−.69**	.09	.08	.10	−.27	−.22	−.10	.02	.08	−.04	−.05	.00	.02
NEO	Tender-mindedness	.16	.24	.03	.28	.23	.16	**−.46**	−.32	**−.41**	−.05	−.05	−.02	−.21	−.37	−.18	.02	.08	.07	.31	.25	.34
PID	Suspiciousness	.37	.33	.29	−.36	−.36	−.39	.22	.31	.32	−.01	.12	−.03	.24	.28	**.41**	.35	.35	.33	−.04	.08	−.04
NEO	Competence	−.38	−.24	**−.41**	.28	.10	.25	.17	.02	−.08	**−.62**	**−.69**	**−.70**	−−.02	.00	−.09	−.10	−.10	−.09	.05	.11	.06
NEO	Self-discipline	−.29	−.29	−.35	.22	.14	.12	−.11	−.10	−.05	**−.72**	**−.77**	**−.81**	−.06	.06	.07	.18	.06	.00	−.09	−.14	−.14

(Continued on next page)

Table 1. (Continued)

Scale		E − X			X + E			−H			−C			−A			Psychoticism?			O		
		S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
PID	Distractability	.29	.37	**.50**	−.18	−.08	−.22	.15	.18	.19	**.57**	**.60**	**.49**	.04	−.03	−.01	.17	.33	.35	.11	.11	.13
NEO	Deliberation	.07	.11	−.08	−.30	−.27	−.03	.02	−.10	−.17	**−.69**	**−.65**	**−.65**	−.23	−.32	−.34	−.23	−.21	−.20	.02	−.05	−.04
PID	Irresponsibility	.05	.15	.25	−.13	−.25	−.22	**.41**	**.47**	**.42**	**.58**	**.50**	**.60**	.01	.01	.04	.19	.36	.23	−.09	−.07	−.04
PID	Impulsivity	−.03	.03	.19	.30	.12	.00	.08	.25	.30	**.60**	**.59**	**.55**	.27	.26	.30	.37	**.49**	**.46**	−.03	.00	−.01
NEO	Achievement striving	−.16	−.19	−.26	.12	.27	.27	.02	−.08	.07	**−.71**	**−.74**	**−.71**	.18	.12	.09	.38	.13	.14	.02	−.06	.01
NEO	Dutifulness	.10	−.17	−.15	.00	.18	.14	−.32	−.23	−.31	**−.70**	**−.69**	**−.72**	−.13	−.11	−.17	.09	.07	.04	.08	−.02	.00
NEO	Order	.00	−.04	−.03	.06	.10	−.01	.05	.06	.03	**−.65**	**−.64**	**−.58**	−.06	.09	.26	−.04	−.01	.11	−.13	−.18	−.12
NEO	Impulsiveness	.32	.35	**.41**	.27	.18	.10	−.04	.12	.11	**.43**	.36	**.48**	.31	.31	.39	.05	−.03	.06	.14	.09	.07
PID	Rigid perfectionism	.33	.39	.35	−.24	−.13	−.20	.16	.28	.28	**−.56**	**−.40**	−.32	.03	.08	.24	.32	**.41**	**.43**	−.12	−.16	−.10
NEO	Angry hostility	**.40**	.39	**.50**	−.23	−.15	−.16	.20	.24	.16	.17	.11	.20	**.63**	**.71**	**.59**	.03	−.01	.05	−.01	−.11	.01
NEO	Compliance	.07	.04	−.12	−.09	.05	.07	**−.40**	**−.49**	**−.40**	.01	−.02	−.02	**−.63**	**−.63**	**−.72**	.07	.04	−.02	−.03	.04	.04
PID	Hostility	.28	.33	.38	−.10	−.20	−.29	**.46**	**.47**	.39	.09	.14	.20	**.64**	**.50**	**.55**	.12	.28	.16	−.10	−.10	−.06
NEO	Trust	−.09	−.04	−.22	**.53**	**.46**	**.44**	−.25	−.19	−.25	−.04	.01	.07	−.31	**−.53**	**−.59**	−.12	.07	−.10	.03	−.07	−.03
PID	Perceptual dysregulation	.29	.39	.26	−.22	−.25	−.25	.28	.34	**.41**	.27	.36	.26	.00	−.03	−.01	**.57**	**.53**	**.57**	.31	.15	.12
PID	Unusual beliefs and experiences	.17	.25	.08	−.08	−.23	−.14	**.40**	**.42**	**.43**	.01	.20	.13	−.04	−.07	−.08	**.46**	**.50**	**.50**	.35	.23	.18
PID	Perseveration	**.47**	**.47**	**.58**	−.20	−.23	−.23	.19	.18	.26	.06	.27	.25	.08	−.03	.03	**.46**	**.52**	**.42**	−.05	.00	.03
PID	Eccentricity	.12	.22	.25	−.34	−.22	−.20	.35	.20	.34	.23	.31	.29	.09	.08	.13	**.43**	**.40**	**.46**	.39	.37	.32
NEO	Aesthetics	−.01	.06	−.02	.05	.15	.22	−.14	−.01	−.14	−.06	.13	−.01	.02	−.03	−.06	.16	.14	.14	**.54**	**.68**	**.57**
NEO	Ideas	−.19	−.25	−.09	−.08	.00	.18	.08	−.03	−.02	−.17	−.11	−.16	.06	.01	−.03	.19	.19	.14	**.62**	**.64**	**.65**
NEO	Fantasy	.01	.07	.10	.09	.13	.24	.21	.04	.07	.21	.20	.21	.01	−.03	.02	.06	−.04	−.07	**.71**	**.65**	**.62**
NEO	Feelings	.25	.39	.35	**.42**	**.42**	**.43**	.00	−.09	−.07	−.11	−.13	−.10	.13	.07	.02	.06	.00	−.08	**.53**	**.43**	**.54**
NEO	Values	−.07	−.14	.02	.12	.03	.16	−.12	−.23	−.35	.01	.04	.03	.09	.07	.01	−.04	−.05	−.12	**.57**	**.41**	**.40**
	Congruence coefficients	*.97*	*.96*	*.94*	*.95*	*.97*	*.95*	*.94*	*.94*	*.93*	*.95*	*.95*	*.94*	*.93*	*.90*	*.90*	*.83*	*.86*	*.88*	*.90*	*.90*	*.88*

Notes. S1, S2, and S3 are three samples used by De Fruyt et al. (2013), Griffin and Samuel (2014), and Wright and Simms (2014), respectively. H = Honesty-Humility, E = Emotionality, X = Extraversion, A = Agreeableness, C = Conscientiousness, O = Openness to Experience; NEO-PI-R = NEO Personality Inventory – Revised; PID-5 = Personality Inventory for DSM-5. All solutions are based on orthogonal Procrustes rotation of principal axis factors toward the solution reported in Ashton et al. (2012, Table 4); congruence coefficients are computed against that solution. Absolute factor loadings greater than .40 are typed in boldface.

previously used in Markon et al. (2005) and in Watson et al. (2008); see the latter source for details of the dissociation scales. Here we examine the factor structure of the NEO-PI-R/SNAP/dissociation variable set in this sample.

Results

The first 12 eigenvalues from the NEO-PI-R/SNAP/dissociation variable set were as follows: 9.52, 5.88, 4.55, 4.33, 3.28, 1.76, 1.27, 1.21, 1.09, 0.98, 0.91, and 0.86. Although the eigenvalue plot suggested six factors, we extracted seven components on a priori grounds. Table 2 shows the loadings of the scales on seven varimax-rotated principal components.

As seen in the table, the first factor was interpretable as Conscientiousness, being defined by the six NEO-PI-R facets of that factor domain and also by the SNAP scales Impulsivity (negatively), Disinhibition (negatively), Workaholism, and Propriety.

The second factor was defined by five NEO-PI-R Extraversion facets (Warmth, Gregariousness, and Positive Emotions, and to a lesser extent Activity and Excitement Seeking) and by SNAP scales of Detachment (negatively) and Positive Temperament. The NEO-PI-R Altruism and Trust facets also had their highest loadings on this factor. Given that the three NEO-PI-R facets with loadings above .60 are the same for this factor as for the second factor of the NEO-PI-R/PID-5 analysis of Table 1 – a factor whose counterpart in Ashton et al. (2012) correlated with .74 with HEXACO Extraversion and .46 with HEXACO Emotionality – this third factor of Table 2 can also be interpreted from the HEXACO perspective as an emotional form of Extraversion.

The third factor showed very high loadings for four NEO-PI-R Neuroticism facets (Anxiety, Vulnerability, Self-Consciousness, and Depression) and for the SNAP scales Negative Temperament and Dependence. The Assertiveness facet of NEO-PI-R Extraversion also loaded negatively on this factor. Given that the four NEO-PI-R facets with loadings above .60 are the same for this factor as for the first factor of the NEO-PI-R/PID-5 analysis of Table 1 – a factor whose counterpart in Ashton et al. (2012) correlated with .62 HEXACO Emotionality and −.46 with HEXACO Extraversion – this second factor of Table 2 can also be interpreted from the HEXACO perspective as an introverted form of Emotionality.

The fourth factor was interpretable as dissociation, being defined most strongly by the Questionnaire of Experiences of Dissociation, the Dissociative Experiences Scale, and the three Dissociative Processes Scale subscales (Detachment, Obliviousness, and Imagination), as well as SNAP Eccentric Perceptions.

The fifth factor was interpretable as low Honesty-Humility, being defined negatively by the NEO-PI-R Modesty and Straightforwardness facets and positively by SNAP Entitlement, Manipulation, and Exhibition. (Recall that Straightforwardness and Modesty are the two facets from the NEO-PI-R/3 Agreeableness factor domain that correspond mainly to Honesty-Humility.)

The sixth factor was interpretable as Openness to Experience, with 5 of the 6 facets of the NEO-PI-R Openness to Experience domain having their highest loadings on this factor (the remaining Openness facet, Fantasy, had nearly equal loadings on this dimension and on the dissociation dimension). (The NEO-PI-R facet of Tender-Mindedness, from the Agreeableness domain, also had its highest loading on this factor.)

The seventh factor was interpretable as low HEXACO Agreeableness, being defined negatively by the NEO-PI-R Compliance facet (from the NEO-PI-R Agreeableness factor domain) and positively by the NEO-PI-R Angry Hostility facet (from the NEO-PI-R Neuroticism factor domain), by the NEO-PI-R Impulsiveness facet (also from the NEO-PI-R Neuroticism factor domain), and by SNAP Aggression.

Discussion

The results of this study suggest that the HEXACO factor space can be recovered from analyses of the combined variable sets obtained by adding the NEO-PI-R[3] facets to those of the PID-5 or the SNAP. In the case of the NEO-PI-R[3]/PID-5 variable set, of Study 1, seven factors representing the HEXACO space plus a psychoticism-like dimension were recovered, and in the case of the NEO-PI-R[3]/SNAP/dissociation variable set of Study 2, six factors representing the HEXACO space were recovered, and a seventh dimension similar to psychoticism was defined by the dissociation scales. We expect that these results would generalize well across samples of persons who are willing and able to provide reasonably accurate self-reports of personality.

The interpretations of factors in the NEO-PI-R[3]/PID-5 seven-factor solutions of Study 1 are supported by the high congruence coefficients shown between each set of seven dimensions and the set of seven dimensions reported from the same variable set by Ashton et al. (2012). Scores on the latter set of seven factors were found by Ashton et al. to correlate strongly with scores on another set of seven factors derived from the HEXACO-PI-R facet scales and a set of dissociation scales. (Recall that most of those associations were nearly isomorphic but that one pair of HEXACO factors and one pair of NEO-PI-R/PID-5 factors were orthogonally rotated variants of one another, whereby the Neuroticism factor of the latter set represented an

Table 2. Seven-factor solution from NEO-PI-R, SNAP, and dissociation scales

Scale		C	X + E	E − X	D	H (−)	O	A (−)
NEO	Achievement Striving	**.80**	.15	−.14	.02	.11	.00	.22
NEO	Self-discipline	**.72**	.15	−.29	−.13	.01	−.03	−.02
SNAP	Impulsivity	**−.70**	.08	−.09	.25	.20	−.02	.29
SNAP	Workaholism	**.70**	−.05	.01	.23	.09	.05	.12
NEO	Dutifulness	**.69**	.14	−.17	−.06	−.21	.00	−.06
NEO	Competence	**.69**	.26	−.32	−.01	.07	.13	.07
NEO	Deliberation	**.66**	-.15	−.01	−.17	−.10	−.02	−.35
SNAP	Disinhibition	**−.65**	.02	−.07	.23	.35	−.13	.20
NEO	Order	**.61**	−.07	.04	−.18	.07	−.15	−.01
SNAP	Propriety	**.60**	.21	.28	.04	.22	−.14	-.24
NEO	Warmth	.17	**.78**	−.04	−.08	−.06	.19	−.18
SNAP	Detachment	.10	**−.76**	.02	.27	−.05	.10	.06
NEO	Gregariousness	−.12	**.73**	.09	−.21	.26	−.03	−.08
NEO	Positive Emotions	.14	**.70**	−.12	.03	−.01	.25	−.08
NEO	Altruism	.21	**.58**	−.03	−.02	−.29	.26	−.27
NEO	Trust	.02	**.57**	−.24	−.12	−.36	−.03	−.23
SNAP	Positive temperament	.40	**.55**	−.26	.27	.20	.04	.03
NEO	Activity	**.43**	**.53**	−.18	.12	.20	.06	.25
NEO	Excitement seeking	−.09	**.49**	.01	.09	.32	.21	.13
NEO	Anxiety	.17	.06	**.80**	.17	−.11	.07	.11
NEO	Vulnerability	−.25	−.07	**.79**	.05	−.04	−.11	.06
SNAP	Negative temperament	.11	−.07	**.76**	.26	.14	.03	.27
NEO	Self-consciousness	−.02	−.13	**.75**	.19	−.15	−.01	.06
NEO	Depression	−.13	−.24	**.72**	.27	−.08	−.01	.18
SNAP	Dependency	−.22	.21	**.62**	.04	.10	−.14	−.22
SNAP	Self-harm	−.23	−.35	**.43**	.21	.18	.09	.00
NEO	Assertiveness	.31	.33	**−.42**	.04	.38	−.02	.26
QES	(Overall score)	−.14	−.02	.20	**.81**	.04	.16	.03
DES	(Overall score)	.03	−.03	.12	**.78**	.17	−.06	−.02
DPS	Detachment	−.05	−.18	.08	**.78**	.09	.10	.03
SNAP	Eccentric perceptions	.03	−.15	.16	**.74**	.19	.22	−.01
DPS	Obliviousness	−.15	.01	.16	**.74**	−.07	−.01	.15
DPS	Imagination	−.12	.01	.16	**.65**	.09	.27	.08
NEO	Fantasy	−.26	.18	.08	**.48**	.02	**.43**	.05
SNAP	Mistrust	.00	−.34	.39	**.40**	.38	.05	.05
NEO	Modesty	−.05	−.07	.11	.05	**−.73**	.08	−.17
SNAP	Entitlement	.17	.13	−.08	.17	**.68**	.07	−.03
NEO	Straightforwardness	.18	.18	.06	−.19	**−.61**	.14	−.30
SNAP	Manipulativeness	−.39	−.11	.13	.31	**.60**	−.11	.16
SNAP	Exhibitionism	−.01	**.43**	.04	.07	**.59**	.07	.10
NEO	Aesthetics	.01	−.04	−.01	.23	.07	**.74**	−.12
NEO	Ideas	.21	−.07	−.33	.23	.08	**.64**	.04
NEO	Feelings	.13	.31	.23	.18	−.02	**.62**	.25
NEO	Values	−.06	.14	−.03	−.01	−.20	**.56**	.09
NEO	Tender-mindedness	−.02	.30	.21	.05	−.15	**.44**	−.26
NEO	Actions	−.27	.12	−.21	.06	.11	**.43**	−.26
NEO	Compliance	.07	.23	−.09	.03	−.36	−.01	**−.71**

(Continued on next page)

Table 2. (Continued)

Scale		C	X + E	E − X	D	H (−)	O	A (−)
NEO	Angry hostility	−.05	−.25	**.48**	.06	.20	−.08	**.63**
SNAP	Aggression	−.09	−.26	.11	.17	.37	−.08	**.60**
NEO	Impulsivity	−.23	.22	**.40**	.18	−.03	.13	**.50**

Notes. See text for details of analysis and factor interpretation. H = Honesty-Humility; E = Emotionality; X = Extraversion; A = Agreeableness; C = Conscientiousness; O = Openness to Experience; D = Dissociation; DES = Dissociation Experience Scale; QED = Questionnaire of Experiences of Dissociation; DPS = Dissociative Processes Scale; NEO-PI-R = NEO Personality Inventory – Revised; SNAP = Schedule for Nonadaptive and Adaptive Personality. Absolute factor loadings greater than .40 are typed in boldface.

introverted form of Emotionality and whereby the Extraversion factor of the latter set represented an emotional form of [HEXACO] Extraversion.)

Griffin and Samuel (2014) correctly noted that the six-factor solution from their NEO-PI-R/PID-5 variable set did not match either the six-factor solution reported by De Fruyt et al. (for the same variable set) or the HEXACO structure. However, in the datasets of Griffin and Samuel and of De Fruyt et al. (and also of Wright and Simms), the seven-factor solution from the NEO-PI-R[3]/PID-5 variable set closely matches that reported by Ashton et al. (2012). That solution included six HEXACO-like dimensions (with the alternative rotation of HEXACO Extraversion and Emotionality) plus a factor involving psychotic tendencies but also reflecting elevated responses to all PID-5 scales (cf. Ashton et al., 2017). The emergence of a psychoticism (or schizotypal, or dissociation) factor additional to the HEXACO or Big Five dimensions has also been observed in several previous studies (e.g., Ashton & Lee, 2012; Knezevic, Savic, Kutlesic, & Opacic, 2017; Mededovic, 2014; Watson et al., 2008). (Regarding the similarity between psychotic (or schizotypal) tendencies and dissociation, see also Watson, 2001.)

Regarding the NEO-PI-R/SNAP/dissociation seven-factor solution, we are not able to use the approach employed with the NEO-PI-R/PID-5 variable sets, in which we rotated the obtained seven factors toward seven factors of a previous dataset in which correlations with the HEXACO factors were available. Because of this limitation, it could be useful to obtain in future research a dataset in which the HEXACO factors are measured alongside the NEO-PI-R/SNAP/dissociation variable set. Nevertheless, the interpretations of factors in the NEO-PI-R/SNAP/dissociation seven-factor solution are supported by the similarity of NEO-PI-R facets' factor loadings to those of the NEO-PI-R[3]/PID-5 solutions of Study 1 and by the previously obtained correlations of the NEO-PI-R facets with the HEXACO factors. For example, the strongest NEO-PI-R facet correlates of HEXACO Agreeableness are Compliance and (low) Angry Hostility, and the strongest NEO-PI-R facet correlates of HEXACO Honesty-Humility are Straightforwardness and Modesty (e.g., in the dataset of Ashton et al., 2012). As shown in Table 2, the seventh factor of the NEO-PI-R/SNAP/dissociation seven-factor solution was defined strongly by the former pair of scales, and the fifth factor of that solution was defined strongly by the latter pair of scales. The NEO-PI-R/SNAP/dissociation solution, like the NEO-PI-R/PID-5 solutions of Table 1, also produced two dimensions that correspond to blends of the HEXACO Extraversion and Emotionality factors: an introverted form of Emotionality (dominated by the NEO-PI-R Neuroticism facets of Anxiety, Vulnerability, Self-Consciousness, and Depression) and an emotional form of Extraversion (dominated by the NEO-PI-R Extraversion facets of Warmth, Gregariousness, and Positive Emotions). We note that, although we prefer the HEXACO factor axis locations for their theoretical interpretability and their relative stability across lexical studies of personality structure (e.g., Ashton & Lee, 2007), researchers from the NEO-PI-R tradition may favor these alternative axis locations. Moreover, from the perspective of conceptualizing pathological personality variation, the rotated variants of HEXACO Emotionality and Extraversion both have one pole that is clearly more problematic than the other, whereas both poles of the HEXACO Emotionality axis might be considered potentially problematic, representing a contrast between insensitivity and hypersensitivity.

We note also that the results reported here contradict the claim by DeYoung (2015, p. 36) that "Questionnaire rather than lexical studies do not support the six-factor solution." Even if we exclude from "questionnaire studies" all investigations based on the HEXACO-PI(-R), it is clear that some questionnaire variable sets can indeed recover the HEXACO factor structure. In fact, that structure can even be recovered from a dataset that was used in a source cited by DeYoung (i.e., that of Markon et al., 2005) as showing that the six-factor structure cannot be recovered from questionnaire studies. (Note that, if we remove the dissociation scales from the NEO/SNAP/dissociation variable set of Study 2, the dimensions of the resulting six-component solution are virtually identical to the six non-dissociation dimensions of the seven-component solution shown in Table 2.)

We emphasize that the present results are evidence not of the accuracy of the HEXACO model but rather of the

comprehensiveness of the variable sets being studied. Recall that the evidence for the HEXACO model comes from the findings of standard lexical studies of personality structure, whose variable sets can be taken as representative of the domain of subjectively important personality characteristics. And to the extent that those findings require support from questionnaire-based studies – for example, by showing that the obtained structure is not some artifact of analyses of adjective ratings – that support had already come from analyses of the HEXACO-PI(-R). What the current results do show is that the combined variable sets in question – NEO-PI-R[3] plus either SNAP or PID-5 – represent the six HEXACO dimensions well enough to recover all of them, along with an additional dimension of psychotic or dissociative tendency. Thus, one implication of the present findings is that researchers who are interested in integrating the domains of normal and abnormal personality should adopt a seven-dimensional model incorporating the six HEXACO factors (or variants thereof) as well as an additional dimension of psychoticism or dissociation.

The present research, in conjunction with that of some previous studies (e.g., Ashton et al., 2012), also has some implications for the self-report (and observer report) assessment of maladaptive personality traits. First, although personality traits related to (low) Honesty-Humility are sufficiently represented in the PID-5 and SNAP variable sets, personality traits related to (low) Agreeableness appear to be somewhat under-represented in those inventories. It would thus be useful to include some additional low Agreeableness traits, such as oppositionality and resentment. Also, some aspects of HEXACO Emotionality are not directly assessed in these instruments, particularly phobic tendencies, and would be useful additions to these measures of problematic personality traits. Finally, self-reports of psychotic, dissociative, or schizotypal tendencies appear to carry a considerable amount of response style variance, which might be reduced in future research by developing scales that are balanced for the direction of keying of items.

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