THE UTILITY OF THE NEO-PI-3 IN A SAMPLE OF SOUTH AFRICAN ADOLESCENTS

Emma Boshoff
Department of Psychology
University of the Witwatersrand
boshoffemma@yahoo.com

Sumaya Laher
Department of Psychology
University of the Witwatersrand
sumaya.laher@wits.ac.za

ABSTRACT

Psychological tests, particularly personality tests, are routinely employed for career guidance and counselling, in university selection procedures and therapeutic settings with adolescents. The NEO-PI-3 is the newest revision in the NEO family of personality instruments and has been revised to suit adolescent populations. This research explored the utility of the NEO-PI-3 in a convenience sample of 329 learners from a public school in Johannesburg, South Africa. Utility was established using a mixed methods approach where internal consistency reliability and construct validity of the NEO-PI-3 was explored using Cronbach's alpha and exploratory factor analysis. Learners were also asked to comment on the appropriateness of the NEO-PI-3 items. These comments were subjected to thematic analysis. Reliability coefficients for the NEO-PI-3 scales were variable. The factor structure for this sample was incongruent with cross-cultural samples but a five factor solution resembling the normative sample was found once the Compliance facet was removed. 36.2% of the sample reported experiencing difficulty with understanding words and items on the NEO-PI-3. The most dominant theme identified amongst the learners was a lack of understanding of items and words. This was followed by

problems with item construction, questionnaire length and the repetitive nature of items. The results suggest that the NEO-PI-3 may not be used in its current form in the South African context. Further research and possible test adaption would be needed before using the instrument.

Keywords: adolescence; NEO-PI-3; personality; personality assessment; reliability; validity

Personality tests are frequently used in educational settings for career guidance and general counselling purposes with adolescents. It often forms part of a battery of tests used to get a better sense of the individual in educational and therapeutic settings, to guide diagnosis and aid the development of effective treatment or career pathing plans (Costa, McCrae & Martin, 2008; De Bruin & De Bruin, 2009; Roodt, Stroud, Foxcroft & Elkonin, 2009). In developing countries like South Africa, where there is extreme inequality and lack of access to resources, particularly with regards to education and healthcare, practitioners are reliant on psychological tests to assist learners. It is therefore important that the tests being used are reliable, valid and unbiased. This study seeks to determine the utility of the NEO-PI-3 to a South African sample.

The NEO-PI-3 is a revision of the NEO-PI-R. McCrae, Costa and Martin (2005a) revised 37 out of the 240 items for the NEO-PI-3 specifically to make it easier and more understandable and accessible to younger individuals (McCrae et al., 2005a). A further advantage of the NEO-PI-3 is that it can be administered to children as young as 12 years old, and if they do not understand an item, the administrator may explain it to them (Costa & McCrae, 2008a). Therefore, the NEO-PI-3 could be especially relevant to a population with a low literacy rate like South Africa.

De Fruyt, De Bolle, McCrae, Terracciano, and Costa and Collaborators of the Adolescent Personality Profiles of Cultures Project (2009) argue that there has been much research on the NEO-PI-R using samples of university students. However, comparatively little data exists regarding the utility of the NEO-PI-R as a measure of adolescent personality. The NEO-PI-R was created to be used on individuals of 18 years and older (Costa & McCrae, 2008a) and, as such, it may be difficult for adolescents to understand and interpret the items in the NEO-PI-R. For example, McCrae et al. (2005a) tested the NEO-PI-3 on a sample of 500 American adolescents, ranging from age 14 to 20 and found that, whereas the factor structure of the NEO-PI-3 remained the same, the understanding of the items improved.

THE RELIABILITY OF THE NEO-PI-3

In a sample of 556 individuals, the NEO-PI-3 demonstrated improvements over the NEO-PI-R in terms of internal consistency reliability. At the domain level, internal consistency coefficients were equivalent with a median alpha of 0.89. At a facet

level, item-facet correlations increased for 32 of the 37 revised items from a median correlation of 0.28 to 0.37 while the alpha coefficients were either the same or higher for the NEO-PI-3 compared to the NEO-PI-R. Notable improvement was shown for Tender-Mindedness, which had a coefficient alpha of 0.73 in the NEO-PI-R and 0.77 in the NEO-PI-3. In addition to the sample of 556 individuals, McCrae et al. (2005a) narrowed down the participants to a sample of 133 14 to 17 year olds attaining grades ranging from B to D, in order to examine the applicability of the improved reading level of NEO-PI-3 to a younger sample. In this study, the internal consistency reliability at the domain level ranged from 0.85 to 0.89.

De Fruyt et al. (2009) found that, in a sample of 5109 adolescents aged 12 to 17 from 24 cultures; there was an improvement in facet reliability coefficients from the NEO-PI-R to the NEO-PI-3. As in the case of the aforementioned results, in this cross-cultural sample, the reliability for Tendermindedness improved greatly from .54 in the NEO-PI-R to .69 in the NEO-PI-3. However, the alpha coefficients for Actions and Values remained low even in the NEO-PI-3, with coefficients of .48 and .34 respectively. At the domain level, reliability coefficients were equivalent to or higher than those in the NEO-PI-R, with coefficients ranging from .81 to .96.

THE VALIDITY OF THE NEO-PI-3

Owing to the NEO-PI-3 being a relatively new personality inventory, there is little information available on its validity. However, McCrae, Martin, and Costa (2005b) used a sample of 500 adolescents and 635 adults to determine whether the NEO-PI-3 was applicable to both age groups and found factor congruence ranging from 0.94 to 0.98. Furthermore, in a study of the applicability of the NEO-PI-3 to 536 individuals from age 14 to 20, it was found that both the NEO-PI-R and NEO-PI-3 are applicable to adolescents, with the NEO-PI-3 demonstrating an improvement of the NEO-PI-R (McCrae et al., 2005a). Factor congruence results showed that structures of the NEO-PI-R and NEO-PI-3 are alike, with congruence coefficients ranging from 0.94 to 0.98.

These results are further supported by De Fruyt et al. (2009) who found very similar factor structure for the NEO-PI-R and the NEO-PI-3, with all factor congruence coefficients above .95. Openness to Ideas was the only exception from the factor structure, with a significant secondary loading on Conscientiousness. Adding to these findings, McCrae et al. (2010) gathered new data from the Adolescent Personality Profiles of Cultures (APPOC) Project and found that the five-factor structure is generally replicated across cultures for Neuroticism, Extraversion, Agreeableness, and Conscientiousness. However, Openness to Experience did not replicate well, with Openness to Ideas loading on Conscientiousness and Fantasy and Values having their primary loadings on Extraversion.

APPROPRIATENESS OF ITEMS IN NEO-PI-3

McCrae, Terracciano, and 78 Members of the Personality of Profiles Cultures Project (2005c) gathered data from 36 countries on mainly adult samples. The researchers concluded that the five factors (as in the NEO-PI-R and the FFM) were universally applicable. An important finding for the South African context, however, was the low factor congruence coefficients for the five African countries (Botswana, Nigeria, Burkina Faso, Ethiopia and Uganda). These findings indicate that results of the NEO-PI-R may differ according to whether or not the participant's home language is English (the language in which the NEO-PI-R was administered). McCrae et al. (2005c) also speculate on whether the NEO-PI-R and the FFM has the same meaning in African cultures and suggest that further research be conducted in this area. Given the possible role that language proficiency may have on learners' responses in this study, the researchers incorporated a qualitative element to the study. Learners were asked to identify words or items that they did not understand by marking them off on the questionnaire. At the end of the questionnaire, learners were asked to elaborate on their choice of words or items. Learners also commented generally on the appropriateness of the NEO-PI-3.

Overall, the NEO-PI-3 is postulated to be an improvement on the NEO-PI-R in terms of structure and readability. Furthermore, the majority of samples used to investigate the applicability of the NEO-PI-R and the NEO-PI-3 comprise adults or undergraduate university students. As there is currently little research on the NEO-PI-3 in South Africa and especially in terms of the test being administered to adolescents, it is clear that a greater understanding of the utility of the instrument is needed with regard to South African adolescents. This is moreso as the NEO scales and the FFM are often used as the comparison standard for most personality instruments which are consistently employed for use with adolescents in psychodiagnostic assessments as well as for vocational guidance (De Bruin & De Bruin, 2009; Roodt et al., 2009). Thus, this study explored the reliability and validity of the NEO-PI-3 using a sample of public school adolescents in northern Johannesburg, South Africa. Learners also commented on the experience of answering the NEO-PI-R.

METHODS

Participants

A nonprobability, convenience sample of 329 learners from Grade 11 (n=163) and Grade 12 (n=161), aged 15 to 20 (X=17, SD=.88) from a co-educational school in the northern Johannesburg area completed the questionnaire. Table 1 presents the demographic information of the sample. The sample was fairly evenly split in terms of gender (51% male and 49% female). In terms of race, majority of the sample was Black (47%). Majority of the sample spoke English as a home language (56%).

Table 1:   Demographic information of the sample

Variable		Frequency	%	Cumulative %
Gender	Male	168	51.8	47.9
	Female	161	48.8	100
Grade	11	163	49.4	50.3
	12	161	48.8	100
University	Yes	272	82.4	84.5
	Unsure	35	10.6	95.3
	No	15	4.5	100
Population group	Black	155	47	47.1
	Coloured	41	12.4	59.6
	Indian	107	32.4	92.1
	White	18	5.5	97.6
	Chinese/Japanese/ Taiwanese	4	1.2	98.8
	Other	4	1.2	100
Home language	Afrikaans	4	1.2	1.3
	English	185	56.1	61.0
	IsiNdebele	4	1.2	62.3
	SePedi	11	3.3	65.8
	Siswati	3	.9	66.8
	Sesotho	12	3.6	70.6
	Xitsonga	4	1.2	71.9
	Setswana	26	7.9	80.3
	Tshivenda	2	.6	81.0
	IsiXhosa	11	3.3	84.5
	IsiZulu	42	12.7	98.1
	Other	6	1.8	100

Instruments

Using a mixed methods approach, a questionnaire consisting of a demographics section, the NEO-PI-3 and two questions assessing learners' perception of the NEO-

PI-3 was used. The demographics section asked for information including age, gender, population group and home language. These were used for descriptive purposes only. As part of the NEO-PI-3 instruction, learners were asked to identify any items or words that they did not understand by marking them off on the questionnaire. At the end of the questionnaire learners were asked to provide reasons for their choice of words or items, and also to comment generally on any problems that they encountered whilst completing the questionnaire.

The NEO-PI-3

The NEO-PI-3 is a further revised version of the NEO-PI-R and is designed to be more readable. It consists of 240 items. Items are answered on a 5-point Likert type scale, with responses ranging from S*trongly Disagree (0)* to S*trongly Agree (4)*. The NEO-PI-3 assesses the five basic personality dimensions or domains: Neuroticism (N), Extraversion (E) Openness to Experience (O), Agreeableness (A), and Conscientiousness (C). Each of the domains is measured by 48 items which are further divided into facets of six sets of eight items. These facets provide specific additional information about the domains. Brief descriptions of the facets and domains as described by the test developers, Costa and McCrae (2010) are presented below.

Neuroticism may be defined as a tendency to be anxious, worried, stressed and uneasy more so than usual. The six facets of Neuroticism are Anxiety, Depression, Angry-Hostility, Impulsiveness, Self-Consciousness, and Vulnerability. Extraversion can be defined as the tendency to be socially dominant, active, energetic and lead rather than follow. Extraversion comprises six facets, namely Warmth, Activity, Assertiveness, Excitement-Seeking, Gregariousness, and Positive Emotions. Openness to Experience suggests that the individual appreciates new experiences and has a fondness for aesthetic beauty, has a strong need for variety, and is generally free-thinking in his or her beliefs. The facets of Openness to Experience are Actions, Aesthetics, Fantasy, Feelings, Ideas, and Values. Agreeableness can be described as the degree to which the individual is altruistic, rather than being generally suspicious of others and pessimistic in thinking. The facets of Agreeableness are Altruism, Compliance, Modesty, Tender-Mindedness, Straightforwardness, and Trust. The final domain of the FFM model is Conscientiousness, which can be defined as the degree to which the individual is skilled in the areas of efficiency, organisation, and planning. The facets for this domain are Achievement-Striving, Order, Competence, Deliberation, Dutifulness, and Self-Discipline (Costa & McCrae, 2010).

Procedure

Ethical clearance was obtained from the Human Research Ethics Committee (HREC) at the University of the Witwatersrand in May, 2013 (Protocol number:

HONS/13/002 IH). Permission was also obtained from the Gauteng Department of Education (GDE) and the school principal. Consent was obtained from the parents of the learners prior to the questionnaire being administered, and assent was obtained from the learners themselves. Thereafter, the questionnaire was completed by the Grade 11 and Grade 12 participants. Grade 11 and Grade 12 pupils were the ideal participants for this study, as pupils in these grades are more mature than adolescents in lower grades and the completion of personality questionnaires for vocational and emotional purposes would be most relevant to this group. Learners were given as much time as they needed to complete the questionnaire. On average most learners completed the questionnaire in one hour with no one exceeding 1.5 hours.

Data analysis

Descriptive statistics were obtained by means of frequencies, minimum values, maximum values, standard deviations, means, and skewness coefficients for the variables. The internal consistency reliability of the NEO-PI-3 domains and facets was analysed using the Cronbach-Alpha reliability coefficient. A coefficient alpha of 0.6 or more represents good internal consistency (Nunnally & Bernstein, 1994). Construct validity was analysed by using exploratory factor analyses. Principal components analysis with orthogonal varimax rotation was used to obtain a five-factor solution and a six-factor solution. To assess factorial similarity, the varimax rotation was put through orthogonal Procrustes rotation to the culture-level factor pattern of 108 subsamples targeted to the American normative factor structure (McCrae et al., 2010)[1]. Congruence coefficients were calculated to assess the degree of fit between the solution in this study and that of McCrae et al. (2010). The use of Procrustes rotation and congruence coefficients over confirmatory analysis is highly recommended for studies using the NEO instruments (see Aluja, Garcia, Garcia & Seisdedos, 2005; McCrae, Zonderman, Bond & Paunonen, 1996).

At the end of the questionnaire, the participants were asked to give their opinion regarding the items that they found difficult to understand. Frequencies were obtained for these open-ended responses and data were analysed using basic thematic analysis. Thematic analysis can be defined as a technique used to assign categories to themes present in data collected (Braun & Clarke, 2006). The analysis was conducted using the steps outlined by Braun and Clarke (2006). Step 1 involved familiarity with the data which was achieved by repeated reading of the responses to the open ended questions and making notes for coding themes that arose from respondents' comments at the end of the questionnaire. Step two involved generating initial codes by putting the comments into groups and highlighting different themes that emerged. Next, themes were further investigated in order to determine if there were sub-themes that emerged from the responses. These were then reviewed and

named and the final stage of the analysis involved writing up the responses in their designated themes and subthemes (Braun & Clarke, 2006).

RESULTS

Descriptive statistics and reliability

Table 2 shows the means, standard deviations, minimum values, maximum values, and skewness coefficients for the five domains of the NEO-PI-3 and their facet scales. Mean scores are in the appropriate range and are normally distributed. Table 2 also provides the internal consistency reliability coefficients for the NEO-PI-3. In terms of domain reliability, reliability coefficients were .75 for Neuroticism, .79 for Extraversion, .69 for Openness to Experience, .61 for Agreeableness, and .83 for Conscientiousness. All facet reliability coefficients exceed .60 except for Impulsiveness (Neuroticism, $\alpha = .45$), Anxiety (Neuroticism, $\alpha = .48$), Activity (Extraversion, $\alpha = .46$), Actions (Openess, $\alpha = .31$), Values (Openess, $\alpha = .50$), Straightforwardness (Agreable, $\alpha = .54$), Tendermindedness (A, $\alpha = .56$) and Dutifulness (Conscientiousness, $\alpha = .69$).

Table 2: Descriptive statistics and internal consistency reliability coefficients for the NEO-PI-3

Scale	Mean	SD	Min	Max	Skewness	A
Neuroticism	95.53	18.67	36	157	-.003	**.75**
Anxiety	15.87	4.24	4	27	.07	.48
Angry hostility	16.20	5.13	3	31	.25	.63
Depression	16.42	5.07	1	30	.06	.68
Self-consciousness	15.93	4.82	4	31	.157	.62
Impulsiveness	17.86	4.20	4	28	-.116	.45
Vulnerability	13.26	4.58	1	27	.069	.69
Extraversion	118.11	20.22	57	172	-.102	**.79**
Warmth	20.87	4.41	3	31	-.331	.61
Gregariousness	17.95	5.16	2	30	-.197	.64
Assertiveness	16.82	5.05	2	32	.182	.70
Activity	18.696	3.99	7	29	.05	.46
Excitement-seeking	22.7	5.13	4	32	-.445	.61
Positive emotions	21.06	5.08	4	32	-.314	.69

Openness to Experience	112.57	18.06	67	179	.596	**.69**
Fantasy	20.05	4.86	4	32	.061	.61
Aesthetics	19.08	5.89	4	32	-.014	.70
Feelings	20.25	4.33	8	32	.190	.60
Actions	16.38	3.66	5	29	.276	.31
Ideas	18.41	5.58	3	32	.342	.72
Values	18.40	4.27	8	31	.275	.50
Agreeableness	106.20	16.38	53	157	-.150	**.61**
Trust	14.19	4.39	1	29	.104	.60
Straightforwardness	16.67	4.66	5	29	-.110	.54
Altruism	21.26	4.48	8	32	-.170	.63
Compliance	14.09	5.07	0	27	-.309	.63
Modesty	17.67	5.16	1	30	-.178	.68
Tender-mindedness	22.33	4.34	9	32	-.323	.56
Conscientiousness	104.88	20.59	43	169	.059	**.83**
Competence	17.9	4.25	6	29	-.056	.62
Order	17.78	5.07	6	32	.155	.68
Dutifulness	18.13	4.62	5	31	.009	.59
Achievement striving	19.42	4.91	6	32	-.065	.69
Self-discipline	16.24	4.63	3	30	.201	.64
Deliberation	15.41	4.58	0	29	-.111	.68

Construct validity

This study conducted factor analysis on the facets of the NEO-PI-3 in order to determine the construct validity of the instrument. In this study, both empirical and theoretical techniques were used to determine the number of factors to extract. Theoretically, the NEO-PI-3 proposes five factors. The Guttman-Kaiser greater-than-one (K1) rule suggested the extraction of seven factors. Cattell's scree plot suggested the extraction of five to six factors, while parallel analysis indicated that five factors should be extracted. Therefore, a five-factor solution was initially examined using a principal components analysis with varimax rotation.

From the five-factor solution presented in Table 3, it is evident that Factor 1 can be described as the Conscientiousness factor, with all six facets loading positively

and above .59. For Factor 2, both Extraversion and Openness loaded as expected but both factors loaded together. For Extraversion, all six facets load positively with moderate loadings, ranging from .43 to .62. Openness also loads positively, with all loadings greater than .58, with the exception of Values at .386. Factor 3 can be described as the Neuroticism factor, with all six facets loading positively with moderate to high loadings, from .53 to .77. Neuroticism produced one cross-loading of -.441 on the Gregariousness facet. Factor 4 can be described as the Agreeableness factor, with all six facets loading positively with moderate loadings. There were no facets that loaded on Factor 5 above .4 or below -.4. There were a few cross-loadings on the factors but these were not of major concern except for Vulnerability (N) and Gregariousness (E) as the higher of the cross loadings for these facets was not on the theorised factor. Costa and McCrae (1992) argued that cross-loadings for the NEO-PI-3 are acceptable because aspects of personality overlap.

Table 3 also presents the results of the Procrustes rotation and the congruence coefficients. The facets that are significant at the 0.01 level of significance (congruence coefficients of ≥ .95) are Self-Consciousness, Assertiveness, Feelings, Tender-Mindedness, Competence, Achievement-Striving, and Self-Discipline. At the 0.05 level of significance, Anxiety, Angry Hostility, Depression, Impulsiveness, Warmth, Trust, Straightforwardness, Order, and Dutifulness are significant (≥ .87). The Neuroticism facet of Vulnerability, the Extraversion facets of Gregariousness, Activity, Excitement-Seeking, Positive Emotions, the Openness facets of Fantasy, Aesthetics, Actions, Ideas, Values, the Agreeableness facets of Altruism, Compliance, Modesty, and the Conscientiousness facet of Deliberation did not demonstrate significant agreement with the cross-cultural factor structure. At the domain level, Neuroticism (0.89), Agreeableness (0.88), and Conscientiousness (0.87) are congruent between the South African adolescent and cross-cultural samples. Extraversion and Openness to Experience, with congruence coefficients of 0.84 and 0.46 respectively, are not congruent between the samples.

Given the two problematic cross-loadings, the poor congruence results, the combination of Extraversion and Openness on Factor 2 and no loadings on Factor 5, a six- factor solution was examined. According to the six-factor solution in Table 4, Conscientiousness loads on Factor 1 as expected with high and positive values ranging from .649 to .764. Extraversion loads clearly on Factor 2 with positive values ranging from .429 to .751. Neuroticism loads on Factor 3, with values ranging from .404 to .784. Openness loads clearly on Factor 4, with loadings ranging from .387 to .719 and no cross-loadings. Angry Hostility (N) and Compliance (A) are the only two facets which load on Factor 5. Factor 6 can be described as the

Table 3: 5-factor solution for the NEO-PI-3 using varimax and Procrustes rotation with congruence coefficients

Scale	Varimax Rotation					McCrae et al. (2010)					Procrustes Rotation					Cong
	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5	
Anxiety	-.210	.040	**.772**	.07	-.009	**.83**	.11	.03	.22	.19	0.80	-0.05	-0.00	0.05	-0.10	0.91*
Angry hostility	-.070	-.148	**.601**	-.368	.112	**.80**	-.01	-.03	-.19	-.17	0.58	-0.14	-0.22	-0.37	0.03	0.87*
Depression	-.389	-.133	**.695**	.075	.050	**.81**	-.14	.04	.19	.01	0.73	-0.11	-0.17	0.05	-0.29	0.88*
Self-consciousness	-.263	-.224	**.756**	.006	.000	**.77**	-.20	-.10	-.06	.07	0.76	-0.24	-0.19	-0.00	-0.17	0.95**
Impulsiveness	**-.418**	.330	**.533**	-.126	.052	**.48**	.29	.23	-.33	**-.49**	0.62	0.24	0.13	-0.18	-0.30	0.94*
Vulnerability	**-.635**	-.143	**.541**	-.067	-.061	**.77**	-.13	.29	.10	-.28	0.61	-0.16	-0.10	-0.10	-0.56	0.80
Warmth	.034	**.551**	-.309	.389	.381	-.12	**.64**	.27	**.41**	-.20	-0.22	0.72	0.09	0.34	0.05	0.92*
Gregariousness	-.270	**.430**	**-.441**	.158	.172	.03	**.70**	**.43**	.20	.00	-0.33	0.53	0.15	0.11	-0.29	0.74
Assertiveness	**.416**	**.422**	-.336	-.211	.090	-.24	**.53**	**.39**	-.21	**.39**	-0.35	0.36	0.23	-0.22	0.41	0.95**
Activity	.317	**.477**	-.072	-.160	.280	-.18	**.44**	**.60**	-.35	.16	-0.06	0.50	0.11	-0.19	0.37	0.74
Excitement-seeking	-.108	**.620**	-.120	-.247	.163	-.18	**.51**	-.16	**-.51**	-.17	-0.04	0.58	0.27	-0.30	-0.06	0.76
Positive emotions	.108	**.586**	-.385	.147	.214	.06	**.53**	**.45**	.26	.03	-0.32	0.62	0.24	0.11	0.11	0.80
Fantasy	-.212	**.684**	.044	-.115	-.158	.38	**.65**	-.01	-.09	-.34	0.14	0.42	0.55	-0.17	-0.17	0.64
Aesthetics	.124	**.643**	-.016	.032	.044	.31	-.03	**.46**	.38	**.58**	0.04	0.50	0.39	-0.01	0.16	0.46
Feelings	.081	**.636**	.274	.096	.076	.27	**.59**	**.44**	.27	.17	0.33	0.49	0.35	0.04	0.16	0.95**
Actions	.045	**.590**	-.319	.007	-.158	-.24	-.03	**.73**	-.11	.17	-0.26	0.38	0.52	-0.03	0.02	0.79
Ideas	.355	**.583**	-.108	-.093	-.102	-.14	-.09	-.02	-.18	**.50**	-0.10	0.34	0.48	-0.12	0.36	0.45
Values	.156	**.386**	-.089	.159	-.249	-.19	**.51**	-.13	.22	-.18	-0.07	0.14	0.46	0.14	0.13	0.10
Trust	.100	.162	-.256	**.455**	.192	-.05	**.46**	.15	**.40**	-.03	-0.23	0.30	-0.01	0.45	0.08	0.87*
Straightforwardness	.124	-.119	-.037	**.642**	-.017	-.07	-.17	.26	**.59**	-.01	-0.05	-0.06	-0.04	0.66	0.08	0.87*
Altruism	.309	**.465**	-.038	**.568**	.215	.00	**.71**	-.18	.29	.16	-0.00	0.50	0.17	0.54	0.33	0.80
Compliance	-.165	-.276	-.246	**.479**	-.091	.05	**-.47**	.08	**.48**	.23	-0.23	-0.18	-0.10	0.50	-0.24	0.55
Modesty	.077	-.131	.225	**.584**	-.157	.03	.10	-.14	**.47**	-.18	0.21	-0.19	0.05	0.59	0.06	0.71
Tender-mindedness	.304	.330	.204	**.478**	.230	.19	**.41**	-.18	**.46**	**.52**	0.22	0.37	0.06	0.46	0.35	0.94**
Competence	**.770**	.181	-.248	.007	.149	-.26	.39	-.11	-.01	**.75**	-0.33	0.19	0.05	0.03	0.75	0.95**
Order	**.717**	-.077	-.043	.084	-.012	-.02	-.13	.22	.28	**.78**	-0.16	-0.13	0.00	0.13	0.69	0.94*
Dutifulness	**.698**	.172	-.056	.239	.207	.02	.02	.15	**.40**	**.83**	-0.12	0.22	0.00	0.26	0.70	0.93*
Achievement-Striving	**.771**	.288	-.048	-.086	.153	-.10	.15	.24	-.11	**.88**	-0.13	0.24	0.11	-0.07	0.79	0.98**
Self-discipline	**.795**	.014	-.189	.064	.024	-.13	.04	.12	.22	**.87**	-0.30	-0.03	0.04	0.10	0.75	0.96**
Deliberation	**.593**	-.093	-.264	.195	.034	-.09	-.38	-.02	.41	**.72**	-0.35	-0.06	-0.04	0.23	0.54	0.85
Factor congruence											0.89*	0.84	0.46	0.88*	0.87*	0.82

Cong=congruence coefficient; *p<0.05; **p<0.01

Table 4:   6 Factor and 5 factor excl Compliance solutions for the NEO-PI-3

Scale	6-factor solution for the NEO-PI-3						5-factor solution excluding Compliance				
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Neuroticism											
Anxiety	.024	-.084	**.784**	.122	-.101	.073	.017	-.148	**.772**	.087	.066
Angry Hostility	.025	-.009	.296	-.073	**-.763**	.015	.049	.141	**.553**	-.084	-.380
Depression	-.209	-.131	**.623**	.013	-.151	.356	-.247	-.161	**.674**	.005	.210
Self-Consciousness	-.169	-.303	**.700**	-.028	.029	.112	-.194	-.377	**.638**	-.053	.109
Impulsiveness	-.311	.224	**.404**	.279	-.333	-.082	-.277	.260	**.496**	.261	-.214
Vulnerability	-.288	-.165	**.741**	-.103	-.015	-.033	-.293	-.231	**.672**	-.134	-.010
Extraversion											
Warmth	.183	**.737**	-.107	.179	.169	.138	.176	**.670**	-.121	.188	.342
Gregariousness	-.099	**.751**	-.110	-.022	.054	-.045	-.082	**.724**	-.115	-.017	.113
Assertiveness	**.400**	**.429**	**-.409**	.111	-.201	-.230	**.444**	**.499**	-.319	.113	-.214
Activity	-.062	**.657**	-.172	.032	-.204	-.139	-.018	**.712**	-.081	.033	-.147
Excitement-Seeking	-.169	**.612**	-.179	.156	-.269	.048	-.139	**.685**	-.032	.167	-.067
Positive Emotions	.179	**.641**	-.123	.230	-.054	-.125	.213	**.641**	-.086	.226	-.017
Openness to Experience											
Fantasy	-.210	.130	.077	**.642**	-.076	-.144	-.171	.142	.104	**.633**	-.170
Aesthetics	.077	.192	.160	**.670**	.054	-.012	.098	.153	.160	**.656**	.047
Feelings	.268	.354	.228	**.490**	-.241	.076	.280	.356	.330	**.479**	.038
Actions	-.182	.172	-.410	.387	-.190	.372	-.190	.268	-.223	**.424**	.102
Ideas	.355	.006	-.135	**.624**	.139	-.029	.360	-.032	-.161	**.623**	.077
Values	-.074	.002	-.158	**.719**	.015	.146	-.077	.008	-.110	**.735**	.085
Agreeableness											
Trust	.158	**.423**	-.076	.046	.398	.116	.124	.297	-.208	.057	**.437**
Straightforwardness	.226	-.049	.071	-.161	.296	**.499**	.145	-.149	.012	-.141	**.601**
Altruism	**.400**	.363	.073	.175	.291	**.445**	.342	.244	.033	.187	**.633**
Compliance	-.010	-.161	.118	-.035	**.831**	.183					
Modesty	-.219	-.189	.137	.026	.084	**.748**	.220	.398	.327	.125	**.507**
Tender-Mindedness	.270	**.453**	.247	.116	-.047	**.505**	.124	.297	-.208	.057	**.437**
Conscientiousness											
Competence	**.710**	.135	-.267	.127	.051	-.150	**.727**	.129	-.273	.119	-.016
Order	**.683**	-.138	.030	-.149	-.068	.021	**.680**	-.131	.064	-.164	.014
Dutifulness	**.649**	-.119	-.021	-.036	.347	.037	**.618**	-.223	-.149	-.043	.291
Achievement Striving	**.693**	.218	-.089	.055	-.096	-.125	**.716**	.229	-.047	.039	-.058
Self-Discipline	**.764**	-.044	-.229	.007	.050	.038	**.754**	-.051	-.217	.005	.107
Deliberation	**.728**	.177	-.065	.069	.031	.207	**.704**	.145	-.029	.068	.279

determine if the factors would load appropriately, first without Angry Hostility, then without Compliance, and finally without Angry Hostility and Compliance. From the three matrices examined, it was evident that the Compliance facet was problematic. The five factors replicated clearly once Compliance was removed from the analysis (See Table 4). Factor 1 is clearly defined as the Conscientiousness factor. Factor 2 can be defined as the Extraversion factor. Factor 3 is the Neuroticism factor. Finally, Factors 4 and 5 are also well-defined with Factor 4 being Openness to Experience and Factor 5 is the Agreeableness factor (Compliance excluded).

Qualitative item analysis

The appropriateness of the items in the NEO-PI-3 was examined by having the respondents indicate which words they considered inappropriate or did not understand. This was especially relevant to the South African context, as 43.9% of the respondents indicated that English was not their home language. In total, 36.2% (n=119) of the sample experienced difficulty understanding some of the items. Table 5 presents items and words that were found to be problematic by at least 1% of the sample. Item 70 with the word "methodical" was found to be the most difficult to understand, with 7.6% (n=25) of the sample finding this word problematic. After "methodical", the words presenting the highest frequency of linguistic difficulty were "controversial" in Item 28 (5.5 %), "conscientiously" in Item 15 (5.17%), "jittery" in Item 91 (4.6%), and "philosophical" in Item 53 (4.3%). The words "clutter" in Item 10 and "merciful" in Item 239 had frequencies of 2.43%. "Egotistical" in Item 14 and "happy-go-lucky" in Item 147 had frequencies of 2.74%. "Seldom" in Items 103 and 71 was problematic, with a collective frequency of 2.13%.

In addition to identifying the words that they found problematic, respondents were also asked to comment on the appropriateness of the questionnaire more generally. The responses were analysed using thematic analysis. From the responses of the 10.6% (n=35) of respondents who commented, five broad themes were identified, namely 1) Lack of understanding 2) Problems with item construction 3) Questionnaire was too long 4) Questions were repetitive and 5) Questions were inappropriate. Lack of understanding was the most common problem, with 4.56% of the respondents who commented suggesting that they experienced linguistic difficulty. Respondent 75 wrote, "vocab. structure was too hard." Respondent 281 commented, "I don't understand the word and decided to make my own definition and also skipped the question."

Table 5:   Problematic words as identified by respondents

Problematic word/ phrase	Item number	Domain	Facet	Frequency	% of sample
Some people think I'm selfish and **egotistical**.	14	A	Altruism	9	2.74
I would rather be known **as "merciful" than as "just."**	239	A	Tender-Mindedness	8	2.43
I'm not **crafty or sly**.	9	A	Straightforwardness	4	1.22
I'm pretty **slick** when it comes to dealing with people.	219	A	Straightforwardness	4	1.22
I believe that most people are **basically well-intentioned**.	34	A	Trust	4	1.22
I am not a very orderly or **methodical** person.	70	C	Order	25	7.6
I try to perform all tasks assigned to me **conscientiously**.	15	C	Dutifulness	17	5.17
I don't mind a little **clutter** in my room.	10	C	Order	8	2.43
I follow my **ethical principles strictly**.	165	C	Dutifulness	4	1.22
I'm not **happy-go-lucky**.	147	E	Positive Emotions	9	2.74
I have felt **overpowering joy**.	57	E	Positive Emotions	5	1.52
I am **dominant, forceful and assertive**.	12	E	Assertiveness	4	1.22
I often feel tense and **jittery**.	91	N	Anxiety	15	4.56
I am not considered a **touchy or temperamental** person.	96	N	Angry Hostility	9	2.74

I **seldom** give in to my impulses.	141	N	Impulsiveness	7	2.13
Even **minor annoyances** can be frustrating for me.	216	N	Angry Hostility	4	1.22
I **seldom feel self-conscious** when I'm around people.	46	N	Self-Consciousness	4	1.22
I **believe letting students hear controversial speakers** can only confuse and mislead them.	28	O	Values	18	5.47
I find **philosophical arguments** boring.	53	O	Ideas	14	4.26
On vacation, I prefer going back to a **tried and true spot**	198	O	Actions	6	1.82
I have a lot of **intellectual curiosity**.	203	O	Ideas	5	1.52

In terms of the item construction, 3.65% of respondents who commented suggested the ambiguity of some of the items, with Respondent 16 commenting that, "the ones I encountered were a bit vague to me. I saw more than one possible meaning to the statement." 3.65% of respondents also commented on the length of the questionnaire. Respondent 54 commented, "This thing is very interesting but way too long …'

2.43% of the respondents who commented found the content of the questionnaire inappropriate, with Respondent 297 writing, "I understood everything but there are some real stupid questions to ask Grade 11s." Under 1% of the respondents who commented found the questions to be repetitive, with Respondent 264 writing, "Some questions are the same thing over and over again and touch on the same topic which is quite boring."

DISCUSSION

All scales were normally distributed, with means, standard deviations, and minimum and maximum values coinciding with the ranges proposed by McCrae and Costa (2010). The internal consistency reliability coefficients for this study, however, are low compared to those of the NEO-PI-3 normative sample (McCrae et al., 2005a)

and in comparison to those attained by De Fruyt et al, (2009) in their cross-cultural comparison of performance on the instrument (see Table 6). Openness to Experience and Agreeableness had much lower alpha coefficients compared to the normative sample. It must be noted that while De Fruyt et al. (2009) did not report alpha coefficients for each domain, they did suggest that domain alpha coefficients ranged from .81 to .96. Thus, with the exception of Conscientiousness, the South African adolescent sample domain alpha coefficients did not fall within the range of those reported by De Fruyt et al. (2009).

Table 6:   Comparison of internal consistency reliability coefficients for the neo-pi-3 (form s, adolescent scale) for South African adolescent sample, De fruyt et al. (2009), and Mccrae et al. (2005a)

Scale	SA adolescents	De Fruyt et al. (2009)	McCrae et al. (2005a)
Neuroticism	**.75**		**.91**
Anxiety	.48	.73	.77
Angry hostility	.63	.76	.71
Depression	.68	.73	.77
Self-consciousness	.62	.64	.75
Impulsiveness	.45	.65	.66
Vulnerability	.69	.74	.72
Extraversion	**.79**		**.89**
Warmth	.61	.76	.76
Gregariousness	.64	.74	.75
Assertiveness	.70	.69	.75
Activity	.46	.64	.57
Excitement-seeking	.61	.67	.64
Positive emotions	.69	.73	.77
Openness to Experience	**.69**		**.89**
Fantasy	.61	.61	.77
Aesthetics	.70	.70	.81
Feelings	.60	.60	.76
Actions	.31	.48	.48
Ideas	.72	.79	.79

Values	.50	.34	.63
Agreeableness	**.61**		**.87**
Trust	.60	.75	.77
Straightforwardness	.54	.70	.67
Altruism	.63	.76	.72
Compliance	.63	.72	.67
Modesty	.68	.75	.75
Tender-mindedness	.56	.69	.66
Conscientiousness	**.83**		**.92**
Competence	.62	.78	.70
Order	.68	.80	.79
Dutifulness	.59	.78	.69
Achievement striving	.69	.80	.78
Self-discipline	.64	.83	.77
Deliberation	.68	.80	.76

At the facet level, reliability coefficients in this study were all lower than those of the normative and cross-cultural samples, with the exception of Assertiveness and Values, which were higher in the South African adolescent sample than in the cross-cultural sample. Feelings had the same alpha coefficient for both the South African adolescent and cross-cultural samples. Low Tender-Mindedness internal consistency reliability in this study is consistent with other results, especially those from African countries (Laher, 2013). Laher (2013) argues further that the poor reliability of the facet may be due to poor items. Furthermore, perhaps in an adolescent sample, the philanthropy associated with the Tender-Mindedness facet is either not yet fully developed or does not yet apply to them. Overall, while the domain internal consistency reliability in this sample is fairly good, the poor facet reliability coefficients mirror McCrae et al.'s (2005c) finding that reliability coefficients are lower in African samples. Furthermore, the Actions facet points to the problematic nature of the Openness to Experience domain discovered in African samples. Perhaps Openness to Actions is not a meaningful domain in African culture (McCrae et al., 2005c). The reliability results in this study could also mirror the wide-spread demographic of the sample, which suggests that some of the learners may have had better opportunities to expand their experiences and intellect than others.

    Construct validity of the NEO-PI-3 was inspected using exploratory factor analysis with varimax rotation. As is evident from the results section, five factors

were retained by using theoretical and empirical techniques. However, the initial five-factor solution presented the following problems: (a) No facets loaded on Factor 5; (b) Extraversion and Openness to Experience loaded together; (c) Two facets had cross loadings with primary loadings on the incorrect factor; (d) poor congruence coefficients. The Extraversion and Openness to Experience domains were also the ones with the poorest agreement when compared to the cross cultural sample matrix from McCrae et al. (2010). From the items identified as problematic, most were from the Openness to Experience domain suggesting that it is possibly the least understood domain in South African adolescents. However, it could also be argued that epistemic curiosity and aesthetic concerns are not as applicable to adolescents as they may be for adults.

The difficulties with the initial five-factor solution led to the investigation of a six-factor solution. From the six-factor solution it was evident that all domains loaded as expected, apart from Agreeableness. The Angry Hostility facet of Neuroticism and the Compliance facet of Agreeableness loaded together on a separate factor. On examination of factor solutions with Compliance excluded, Angry Hostility excluded and Compliance and Angry Hostility excluded, the five factors were clearly replicated when Compliance was excluded. This finding concurs with results obtained by Laher (2010) which argues that a five factor solution is increasingly being observed amongst younger samples and is an exception to research that has demonstrated that the five-factor solution is not clearly replicated in African samples (Laher, 2013; McCrae et al., 2005c). Furthermore the mean age of the sample in this study is 17 years. McCrae and Costa (2007) have argued that the NEO-PI-3 works better in older adolescents as compared to middle school-age children.

The anomaly with Compliance needs further examination. Upon investigation of the Compliance items (see Table 7), it appears that the content of the items could explain why Compliance in this sample is problematic. The items investigate wrongdoing, co-operation with others, and general hostility. Therefore, in line with Costa and McCrae's (2002) findings, whilst Openness to Experience increases after the age of 12, Neuroticism and Extraversion increase from ages 18 to 30. Agreeableness and Conscientiousness only increase after the age of 18. This they attribute to adolescents being less obliging and diligent than adults. This appears to be exaggerated in this South African sample. A possible explanation for this might come from the South African context, where violence is endemic to the society in which these adolescents live. Non-compliance in adolescents is also applicable to the South African context, where there is a high level of youth violence and bullying, which creates a platform for engaging in risk-taking, and anti-social behaviour (Liang, Flisher, & Lombard, 2007). Furthermore, adolescents are more likely to be violent than their adult counterparts, with the majority of violence happening in the school environment (Burton & Leoschut, 2013). This finding suggests an urgent need for further research into this aspect of adolescent personality with larger and

more representative samples and if replicated, psychoeducation and intervention needs to be urgently implemented.

Table 7:   Compliance items

Item number	Item
1	When I've been insulted, I just try to forgive and forget.
2	If someone starts a fight, I'm ready to fight back.
3	I hesitate to express my anger even when it's justified.
4	I'm hard headed and stubborn.
5	I would rather cooperate with others than compete with them.
6	I can be sarcastic and cutting when I need to be.
7	If I don't like people, I let them know it.
8	I sometimes get into arguments.

In terms of the comments written at the end of the questionnaire, it needs to be acknowledged that only 10.6% of the learners responded to this. However the problems identified with the NEO-PI-3 around length, repetition, and ambiguity of items are commonly cited problems with all personality tests (Cohen, Swerdlik & Stuurman, 2012). There were words or phrases identified as problematic but, given the nature of the sample, further research with bigger and more representative samples is warranted before commenting definitively on the appropriateness of the items in this most recent revision of the NEO.

Once Compliance was removed, it was not possible to compare matrices or determine agreement between the South African sample of adolescents and the cross-cultural sample. Whilst there is evidence that in this sample the NEO-PI-3 structure holds barring the Compliance facet, it is necessary to take cognisance of other findings on the replicability of the Extraversion and Openness to Experience domains. The Openness to Experience domain tends to replicate poorly across Asian and African cultures with varying samples (see Cheung, Cheung, Zhang, Leung, Leong & Yeh, 2008; Laher, 2013). Cheung et al. (2008) argue that Openness to Experience might manifest differently in different cultures arguing further that the expression of Openness might differ based on whether it was being expressed in an individualist or collectivist culture. The Extraversion and Openness to Experience domains did not replicate well in other African studies (see Laher, 2013). Teferi and Laher (2013) concur with Cheung et al. (2008) that the expression of these domains might differ amongst different cultures. In the NEO-PI-R, Extraversion is often associated with sociability and adjectives like sociable, fun loving, affectionate,

friendly and talkative are used to describe the construct (McCrae & Costa, 2010). In the context of Eritrean culture for example, Teferi and Laher (2013) argue that talkativeness cannot be seen as an aspect of Extraversion as people are usually trained to be less talkative and submissive to authority, parents and teachers. Teferi and Laher (2013) concur with Cheung et al. (2008) that these domains in the current form do not replicate well but this may largely be due to the collectivistic culture from which the samples were drawn. They argue further that these domains do not necessarily have no value in these contexts, rather research needs to focus on whether these domains may express themselves differently in the personality structures of individual from more collectivistic cultures. At this point it must be acknowledged that these arguments were based on the NEO-PI-R and on studies on adult samples but the arguments are as applicable to this study on the NEO-PI-3 and an adolescent sample.

CONCLUSION

From the results and discussion presented, it is evident that the NEO-PI-3 should ideally not be used in its current form. Although the reliability coefficients and the five factor solution excluding the Compliance facet suggests that the instrument is generally reliable and valid, the broader arguments presented around specific domains and facets suggests that more research on larger and more representative samples is needed before the instrument can be effectively employed with adolescents in South Africa. It is also necessary to get samples of varying ages within the adolescent category. McCrae and Costa (2007) argued that the NEO-PI-3 does not work as well in middle school-age children as in older adolescents. Of further interest in this study are the findings regarding the low reliability of the Impulsiveness, Vulnerability and Tender-Mindedness facets as well as the validity results with regards to the Openness to Experience and Extraversion domains and the Angry-Hostility and Compliance facets. Further research should explore the potential clinical significance of these results. Specifically with regards to Compliance arguments were made in the discussion about violence amongst South African youth, bullying, risk-taking and anti-social behaviour. These arguments would need to be explored in further research and have the potential to inform interventions to reduce this behaviour in adolescents.

BIOGRAPHICAL NOTES

Emma Boshoff is currently completing her internship for her Masters in Educational Psychology at a remedial school. She is passionate about both teaching and psychology and her interests include child and adolescent therapy, the use of technology in education, and special education.

Sumaya Laher teaches research design, psychometrics, psychological assessment and statistics in the Psychology Department at Wits. She specializes in the field of psychological assessment. Sumaya was awarded a youth rating by the National Research Foundation in 2013 in recognition of her research outputs.

NOTES

1. The following cultures were investigated in this study: Argentina, Australia, Austria, Belgium, Botswana, Brazil, Burkina Faso, Canada, Chile, China, Croatia, Czech Republic, Denmark, Estonia, Ethiopia, France, Germany, Hong Kong, Iceland, India, Indonesia, Italy, Japan, Kuwait, Lebanon, Malaysia, Malta, Mexico, Morocco, New Zealand, Nigeria, Peru, Philippines, Poland, Portugal, Puerto Rico, Russia, Serbia, Slovakia, Slovenia, South Korea, Spain, Switzerland (German), Switzerland (French), Thailand, Turkey, Uganda, United Kingdom: England, United Kingdom: North.

REFERENCES

Aluja, A., García, O., García, L.F. & Seisdedos, N. (2005). Invariance of the NEO-PI-R factor structure across exploratory and confirmatory factor analyses. *Personality and Individual Differences, 38*(8), 1879–1899.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Burton, P., & Leoschut, L. (2013). *School violence in South Africa: Results of the 2012 national school violence study*. Claremont: Centre for Justice and Crime Prevention.

Cheung, F. M., Cheung, S., Zhang, J., Leung, K., Leong, F. & Yeh, K. H. (2008). Relevance of Openness as a personality dimension in Chinese culture: Aspects of its cultural relevance. *Journal of Cross-Cultural Psychology, 39*(1), 81–108.

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

Costa, P. T., Jr., & McCrae, R. R. (2002). Looking backward: Changes in the mean levels of personality traits from 80 to 12. In D. Cervone & W. Mischel (Eds.), *Advances in personality science* (pp. 219-237). New York: Guilford.

Costa, P.T., Jr., McCrae, R.R., & Martin, T.A. (2008). Incipient adult personality: The NEO-PI-3 in middle-school-aged children. *British Journal of Developmental Psychology, 26*(1), 71–89.

Cohen, R. J., Swerdlik, M. E. & Stuurman, E. (2012). *Psychological testing and assessment* (8th ed). Boston: McGraw-Hill.

Costa, P. T., Jr., & McCrae, R. R. (2008a). The revised NEO Personality Inventory. In G. J. Boyle, G. Matthews & D. H. Saklofske (Eds.), *The SAGE handbook of personality theory and assessment* (pp. 179–198). London: SAGE Publications.

Costa, P. T., Jr., & McCrae, R. R. (2008b). The NEO Inventories. In R.P. Archer & S.R. Smith (Eds.), *Personality Assessment* (pp. 213–246). New York: Taylor & Francis.

De Bruin, G.P. & De Bruin, K. (2009). Career counselling assessment. In C. Foxcroft & G. Roodt (Eds.), *An introduction to psychological assessment in the South African context* (pp. 175–184). Cape Town: Oxford University Press.

De Fruyt, F., De Bolle, M., McCrae, R.R., Terracciano, A., Costa, P.T., Jr., & Collaborators of the Adolescent Personality Profiles of Cultures Project. (2009). Adolescent personality profiles of cultures project. *Assessment, 16*(3), 301–311.

Laher, S., & Cockcroft, K. (2013). Contextualising psychological assessment in South Africa. In S. Laher & K. Cockcroft (Eds.), *Psychological assessment in South Africa: Research and applications* (pp. 1–16). Johannesburg: Wits University Press.

Laher, S. (2013). The NEO-PI-R in South Africa. In S. Laher & K. Cockcroft (Eds.), *Psychological assessment in South Africa: Research and applications* (pp. 257–269). Johannesburg: Wits University Press.

Liang, H., Flisher, A.J., & Lombard, C.J. (2007). Bullying, violence and risk behaviour in South African school students. *Child Abuse and Neglect, 31*(2), 161–171.

McCrae, R. R., & Costa, P. T. Jr. (2007). Brief versions of the NEO-PI-3. *Journal of Individual Differences, 28*(3), 116–128.

McCrae, R. R. & Costa, P. T. Jr. (2008a). Empirical and theoretical status of the Five Factor Model of personality traits. In G. J. Boyle, G. Matthews & D. H. Saklofske (Eds.), *The SAGE handbook of personality theory and assessment* (pp. 273–294). London: SAGE Publications.

McCrae, R.R. & Costa, P.T., Jr. (2010). *NEO Inventories: Professional manual*. Lutz, FL: Psychological Assessment Resources.

McCrae, R.R., Costa, P.T., Jr., Terracciano, A., Parker, W.D., Mills, C.J., De Fruyt, F., & Mervielde, I. (2002). Personality trait development from age 12 to age 18: Longitudinal, cross-sectional, and cross-cultural analyses. *Journal of Personality and Social Psychology, 83*, 1456–1468.

McCrae, R. R., Costa, T.P. Jr., & Martin, T.A. (2005a). The NEO-PI-3: A more readable revised NEO Personality Inventory. *Journal of Personality Assessment, 84*, 261–270.

McCrae, R.R., Martin, T.A., & Costa, P.T., Jr. (2005b). Age trends and age norms for the NEO Personality Inventory-3 in adolescents and adults. *Assessment, 12*(4), 363–373.

McCrae, R. R., Terracciano, A., & 78 members of the Personality Profiles of Cultures Project. (2005c). Personality profiles of cultures: Aggregate personality traits. *Journal of Personality and Social Psychology, 89*(3), 407–425.

McCrae, R.R., Terracciano, A., De Fruyt, F., De Bolle, M., Gelfand, M.J., Costa, P.T. Jr., Yik, M. (2010). The validity and structure of culture-level personality scores: Data from ratings of young adolescents. *Journal of Personality, 78*(3), 815–838.

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

Nunnally, J.C., & Bernstein, I.H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.

Roodt, G., Stroud, L., Foxcroft, C. & Elkonin, D. (2009). The use of assessment measures in various applied contexts. In C. Foxcroft & G. Roodt (Eds.), *An introduction to psychological assessment in the South African context* (pp. 203-224). Cape Town: Oxford University Press.

Teferi, T.B. & Laher, S. (2013). Exploring the reliability and validity of a Tigrignan translation of the NEO-PI-R in an Eritrean sample. *IFE Psychologia, 21(1),* 164–181