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Efficient and valid assessment of personality traits: population norms of a brief version of the NEO Five-Factor Inventory (NEO-FFI)

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Summary

Aims: The NEO Five-Factor Inventory (NEO-FFI), a well-established 60-item questionnaire based on the Five-Factor Model (FFM) of personality, provides a valuable framework for the interdisciplinary approach to personality research and clinical practice. In response to the need for briefer personality measures, a 30-item version of the NEO-FFI (NEO-FFI-30) was developed and its factor structure replicated.

Method: The study examines the psychometric quality of NEO-FFI-30 and provides population-based norms (n=1908 adults). Reliability coefficients, kurtosis, skewness, correlations and effect sizes illustrate the psychometric properties of the measure.

Results: The relationships between neuroticism, extraversion, openness, agreeableness, conscientiousness and sociodemographic characteristics confirm previous research findings and speak to the validity of the brief version. Namely, women report higher neuroticism and agreeableness. Younger individuals indicate more extraversion but less agreeableness and conscientiousness. Finally, openness to experience was related to higher education. Percentile ranks are provided for the total sample and for subgroups by age and gender.

Conclusions: The 30-item-version of the NEO-FFI constitutes an assessment tool comparable with the full-length instrument with regard to its psychometric properties. As such, the NEO-FFI-30 is a promising alternative to longer questionnaires, as well as to single-item measures of personality used in research and clinical practice.

Big Five / personality assessment / psychometric properties / population norm

Personality characteristics have been shown to be robust correlates and predictors of behavioural problems, coping strategies and psychiatric disorders [1]. Personality functioning predicts the frequency of the exposure to various kinds of stressors as it affects the appraisal of events as well as the perception of one's coping resources [2]. Research as well as clinical practice benefits from taking personality variables into account when designing and delivering psychotherapeutic interventions and psychiatric treatment regimes for mental disorders [1]. This requires sound personality models as well as valid and feasible assessment instruments.

The Five-Factor Model (FFM) is a well-established paradigm for the conceptualisation of human personality, described in terms of Neuroticism, Extraversion, Openness to Experience, Agreeableness and Conscientiousness [3]. The model provides a valuable framework for the

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multidisciplinary approach to personality examined in relation to mental health, subclinical syndromes and personality disorders [4-7]. Research has demonstrated the replicability of the five core personality traits across cultures and languages [8-11]. The NEO Personality Inventories (NEO-PI) are among the most widely used instruments to assess the Big Five personality traits [12]. The 240-item questionnaires: NEO-PI and its successors NEO-PI-Revised (NEO-PI-R) and NEO-PI-3, capture 6 different facets for each of the 5 personality domains [12]. The short form of the NEO-PI, the NEO Five-Factor Inventory (NEO-FFI), was designed to capture the 5 main factors in a more economical way but does not provide facet-specific information. To maximise convergent and discriminant validity of the NEO-FFI, its 60 items were selected from the NEO-PI based on examinations of factor structure and internal consistency. The subsequent version, the NEO-FFI-R, showed "modest improvements in reliability and factor structure" [13] when compared with the NEO-FFI. However, these differences were found to be "trivial in magnitude" [13]. The authors concluded that the NEO-FFI-R and the NEO-FFI were equally valid. To further improve psychometrics and readability, McCrae & Costa developed the NEO-PI-3 and its short version, the NEO-FFI-3, with the latter being identical to the NEO-FFI-R except for the addition of one new item, "I have no sympathy for beggars" [14].

Internationally, the original 60-item NEO-FFI is the most widely used short version [15]. It is commonly used by German-speaking researchers and practitioners [16]. To date, no German translation of the NEO-FFI-R or the NEO-FFI-3 exists. Ultra-brief instruments that contain only one or two items per personality construct are available for contexts with severely limited assessment time. Although some of these extremely short measures show respectable psychometric properties, they are more susceptible to acquiescence, memory effects, socially desired responding and other assessment problems [17]. The substantially reduced reliability, content validity and criterion validity of such very brief measures demonstrate that complex constructs cannot be sufficiently captured by only one or two items [17]. Using only 30 items of the original 60-item version of the NEO-FFI (with 6 items per domain) offers a middle ground in this dilemma [18, 19]. The 30-item version of the NEO-FFI is currently applied in diverse research contexts [20-25] as well as in clinical settings [26]. The German manual of the NEO-FFI [16] provides age- and gender-specific population norms for the original 60-item version of the measure. These normative data are based on the non-clinical participant pool of more than 50 individual studies with 12[th]552 participants who completed the NEO-PI-R in Germany, Austria and Switzerland. The authors selected a secondary quota sample of 871 males and females, which matches the population of Germany in 2001 regarding gender, age and education. To date, no normative data representative of the general population of any country have been published for the 30-item version of the NEO-FFI. The aim of the present work is to examine the psychometric properties of the NEO-FFI-30 instrument, to provide German population norms, and to introduce the NEO-FFI-30 to the larger professional community, i.e. non-German speaking researchers and clinicians.

MATERIALS AND METHOD

Sample

A sample representative of the German population was drawn for a multi-topic survey of the University of Leipzig, Germany, in November 1999, which included the 60 items of the NEO-FFI. The study was approved according to the ethical guidelines of the Committee of the Institutes of Market and Social Research, Germany [27], and conducted in compliance with the ethical principles of the Helsinki Declaration [28]. Participants were selected following the random-route method with 182 sample areas replicating federal election districts across Germany to systematically represent the different regions of the country [29]. In 31% of the randomly selected cases the targeted person or the household representative declined participation, resulting in a participation rate of 69%. This study includes 1908 German participants of 18 years of age or older (Table 1 – *next page*). Comparisons with census data showed that the sample closely matched the total population of the former Eastern and Western Germany in terms of age, education and employment status [30]. However, 55% of the sur-

Table 1. Sociodemographic characteristics of the study sample

Variable		Absolute frequency (Relative frequency)	
Age in years	Mean (SD) 47.7 (16.9)		
	Range 18-96		
	Age groups 18 to 33	472	(24.7%)
	34 to 49	580	(30.4%)
	50 to 65	527	(27.6%)
	> 65	329	(17.2%)
Sex	Male	853	(44.7%)
	Female	1055	(55.3%)
Marital status	Married	1045	(54.9%)
	Single	452	(23.7%)
	Divorced	165	(8.7%)
	Widowed	243	(12.8%)
Education	Less than 8 years of schooling*	57	(3.0%)
	Basic secondary school (8-9 years)	758	(39.9%)
	Secondary school (10-11 years)	680	(35.8%)
	General qualification for university entrance	141	(7.4%)
	Technical college (3 years)	100	(5.3%)
	College (4 years) or university degree	161	(8.5%)
	Still in secondary school	1	(0.1%)
Employment status	Full-time employment >35 hours/week	787	(41.4%)
	Part-time employment 15-35 hours/week	118	(6.2%)
	Part-time employment < 15 hours/week	33	(1.7%)
	Military/civilian service, maternity leave	25	(1.3%)
	Unemployed/ 0 hours short-term employed	182	(9.6%)
	Retired	554	(29.2%)
	Homemaker	123	(6.5%)
	In training	78	(4.1%)
Net household income	< 750 €/month	135	(7.4%)
	≥ 750 – 1250 €/month	480	(26.2%)
	≥ 1250 – 2000 €/month	704	(38.4%)
	> 2000 €/month	514	(28.0%)

Note. 1833 ≤ N ≥ 1908 (Household income not reported by 75 participants. Missing data for the other variables range between 0 and 10); * Starting with grade 1

vey respondents were women while only 51% of the total population are female. Furthermore, 55% of the participants were married compared with 47% in the general population.

Measures

The NEO-FFI captures the Big Five personality traits with item responses ranging from 0 (“strong disagreement”) to 4 (“strong agreement”) [31, 32]. The use of only 30 of the original 60 items of the NEO-FFI was proposed in response to the examination of the factor structure of the original instrument in the above-mentioned German population sample [33]. Whereas previous studies had used various research samples (university students, individuals in training to become military officers, etc.), this was the first work reporting on the factor structure in the general population. Numerous items did not load highest on their respective factor. The differentiation between Agreeableness and Consci-

entiousness seemed particularly compromised as 6 items (3 items from each scale) showed highest loading on the "wrong" factor [33]. The proposed abbreviated version, the NEO-FFI-30, includes 6 items per scale, all of which showed the highest corrected item-scale correlation for their respective original NEO-FFI scale based on the study sample described above [18]. The five-factor structure across these 30 items was replicated in a second population sample with 2508 adults [18].

RESULTS

Item characteristics

Each item of the Neuroticism subscale correlated with the entire subscale (after excluding the respective item) between 0.53 and 0.62. The corrected item-scale correlation ranged between 0.40 and 0.55 for the items of the Extraversion subscale, between 0.35 and 0.46 for Openness to Experience, between 0.35 and 0.60 for Agreeableness, and between 0.51 and 0.57 for Conscientiousness. Each item correlated higher with its own subscale than with any other subscale.

Psychometric characteristics of the NEO-FFI-30

Cronbach's alpha ranged between 0.67 and 0.81 for the NEO-FFI-30 scales, which can be compared with the range of 0.63 to 0.82 for the original, twice-as-long scales of the NEO-FFI. Part-whole correlations between the abbreviated and the original scales ranged between 0.88 for Openness to Experience and 0.93 for Neuroticism. The mean scores for Neuroticism, Extraversion and Openness differed only minimally when computed using the abbreviated versus the original scales (Table 2). Cohen's effect size indicated moderate differences between the 6- and the 12-item versions of the Agreeableness and Conscientiousness subscales. All scale means were highest for Conscientiousness and lowest for Neuroticism.

Table 3 shows scale means and standard deviations of the NEO-FFI-30 by age, gender and education. Younger age groups reported higher Extraversion and lower Agreeableness and Conscientiousness. Women scored higher on Neuroticism and Agreeableness than men. The dichotomous variable of education was computed by dividing the sample into the group of individuals who completed a maximum of 11 years of general education (starting at grade 1), which generally is followed by a vocational training, versus the group of individuals who completed the 12 or 13 years of general schooling necessary to qualify for university entrance. The more educated group reported more Openness to Experience. A multivariate analysis of covariance ($1/1763 \leq d.f. \geq 1/172$) confirmed that after controlling for the effects of the other independent variables the covariate age explained

Table 2. Comparison of original and abbreviated version of the NEO-FFI scales

Scales		M	SD	Cronbach's α	r_{tt}	r	ES
Neuroticism	Long version	1.62	0.62	.82	.82	.93	0.14
	Short version	1.52	0.77	.81	.83		
Extraversion	Long version	2.20	0.50	.73	.73	.89	-.14
	Short version	2.28	0.62	.72	.73		
Openness to experience	Long version	2.04	0.47	.63	.67	.88	0
	Short version	2.04	0.64	.67	.59		
Agreeableness	Long version	2.54	0.47	.72	.75	.91	-.44
	Short version	2.79	0.65	.75	.72		
Conscientiousness	Long version	2.71	0.55	.82	.82	.91	-.42
	Short version	2.96	0.62	.78	.78		

Note. $1,893 \leq N \geq 1,908$; rtt = split-half reliability coefficient (Spearman-Brown); r = part-whole correlation between long and short version (Pearson); ES = effect size (Cohen)

Table 3. NEO-FFI-30 scale scores by age, sex and education

Scale	Age	Sex	Education						
		18-33	34-49	50-65	> 65	Male	Female	≤ 11 years	> 11 years
Neuroticism									
	N	471	577	524	323	850	1045	1484	400
	M	1.52	1.54	1.51	1.49	1.38	1.62	1.53	1.48
	SD	.76	.79	.77	.73	.77	.75	.78	.73
Extraversion									
	N	471	578	524	323	850	1046	1485	400
	M	2.46	2.35	2.21	2.01	2.31	2.25	2.26	2.34
	SD	.60	.64	.57	.60	.63	.62	.63	.59
Openness to									
	N	470	578	524	322	849	1045	1484	400
	M	2.08	2.06	2.03	1.97	2.04	2.05	1.95	2.39
	SD	.68	.68	.59	.56	.67	.60	.60	.65
Agreeableness									
	N	470	578	524	323	849	1046	1485	400
	M	2.65	2.75	2.87	2.92	2.71	2.85	2.80	2.74
	SD	.65	.65	.64	.61	.66	.64	.66	.62
Conscientiousness									
	N	470	579	524	324	849	1048	1486	401
	M	2.80	2.94	3.08	3.02	2.94	2.97	2.97	2.95
	SD	.61	.64	.60	.61	.63	.62	.63	.62

Note: N = 1908; M = mean total sum over all items of the subscale divided by number of items

between 2% and 6% of the variance (i.e. partial ◎2 in the subscales of Extraversion, Agreeableness and Conscientiousness (F=107.13, P≤0.001; F=27.43, P≤0.001; and F=38.75, P≤0.001 respectively). Gender explained 0.3% to 2% of the variance of Neuroticism, Extraversion and Agreeableness (F=35.14, P≤ 0.001; F=5.12, P≤ 0.05; and F=10.15, P≤0.001 respectively), whereas education explained 8% of the variance in the Openness to Experience subscale (F=158.77, P≤0.001). There were no significant interaction effects except for the gender and education variables. However, this interaction effect explained only 0.3% of the variance of the subscales Openness to Experience and Conscientiousness and as such is considered negligible (F=4.96, P≤ 0.05 and F=4.78, P≤0.05 respectively).

Population-based norms for the NEO-FFI-30

Percentile ranks for the whole sample and for the subgroups by age and gender are provided in Tables 4–8 of the *Appendix*. This allows for comparing personality characteristics of individuals and of groups, such as research samples, to the levels of these traits in the general population by either using the reference values for the whole study sample or for a respective subsample. Means and standard deviations are added to each table in order to permit the transformation into alternative standardized scores.

DISCUSSION

The high corrected item-scale correlations for all items of the abbreviated NEO-FFI instrument

were found to be superior to the item characteristics of the original 60-item measure for which this discrimination coefficient was less than 0.40 for 27 items and less than 0.30 for 13 items [30]. Cronbach's alpha did not differ significantly between the original 12-item and the proposed 6-item versions of the five scales and was satisfactory for Neuroticism, Extraversion, Agreeableness and Conscientiousness. The low internal consistency for Openness to Experience seems only acceptable for group comparisons and other research purposes, but has to be interpreted in relation to the small number of items of the subscales of the NEO-FFI-30. Moreover, Cronbach's alpha of Openness to Experience seems to reflect a general problem with the operationalization of this construct, which has been reported across languages as these items seem to focus on interests in philosophy, art and theoretical discussions rather than capturing a broader concept of openness to experience – an issue also reported for other FFM questionnaires [34]. However, it is remarkable that the shortened Openness subscale achieves an even higher Cronbach's alpha than the original version with twice as many items (0.67 and 0.63 respectively).

Despite containing only six items, the shortened scales correlate highly (between 0.88 and 0.93) with the original scales indicating that the elimination of items did not result in a significant loss of information. Cohen's effect size indicates moderate differences between the short and the original scales for Agreeableness and Conscientiousness, which further speaks for the content validity of the short scales as these two NEO-FFI scales had been particularly problematic (only 5 of the 12 original items had their highest loading on the Agreeableness factor, 3 of the 12 original Conscientiousness items possessed the highest factor loading for Agreeableness and 1 item loaded highest on Neuroticism) [33].

The relationships of the NEO-FFI-30 scales with demographic variables such as age, gender and education confirm previous research findings and clinical experience [35-37]. Gender explained less score variance in our sample than age, yet it is a very robust finding across cultures that women report higher Neuroticism and Agreeableness than men [38, 39]. Consequently, standardised scores are reported with the total sample as reference for men as well as women by age group. Overall, providing standardised scores based on a representative population sample should further facilitate the utilisation of this reliable and valid measure as an alternative to the original 60-item NEO-FFI as well as to the ultra-short measures of personality. Using the NEO-FFI-30 circumvents the common psychometric problems of measures with one or two items per personality trait while the abbreviated instrument still responds to the need for time efficiency by employing only 6 items per personality factor. This facilitates research in contexts where numerous variables have to be assessed or where personality factors are not the main focus of the study [40]. Hence, NEO-FFI-30 enables research that would not even be attempted with longer, multi-item measures. At the same time, the abbreviated 6-item scales may prevent an issue reported for single-item measures of personality characteristics - that is "to substantially underestimate the role that personality traits play in influencing important behaviours and thereby overestimate the role played by new constructs" [17, p. 874]. With 5-10 minutes of administration time, in clinical practice the questionnaires can serve as an efficient screening tool to help adjust communication strategies and intervention plans to risk-related or protective personality characteristics of the individual patient.

Yet, the NEO-FFI-30 was developed based on a German population sample drawn almost 15 years ago. Based on cohort studies, one could argue that the age of the data is the lesser evil because for the population-based standardisation of personality scores there is no such thing as the Flynn effect for IQ scores. Thus, research as well as clinical practice may still benefit from the opportunity to compare NEO-FFI-30 scores of individual clients or research samples to the population norms provided here. More caution is required when consulting the German population norms as a reference for scores of examinees that are not represented in the current standardization sample of the NEO-FFI-30. Nonetheless, the present study details of the Big Five scores in the general population of Germany may be valuable for transcultural and across-language comparisons and potentially ignite and inform the examination of the NEO-FFI-30 by non-German speaking research teams.

CONCLUSIONS

The use of only 30 items of the NEO-FFI constitutes an assessment approach comparable with the full-length instrument regarding reliability and validity. As such it provides a viable alternative to longer, multi-item instruments as well as to ultra-brief measures of personality. It allows for an efficient assessment of the Big Five personality factors without significant loss of information or psychometric quality when compared with the original 60-item measure. Future research should examine the psychometric properties of the 30-item version of the NEO-FFI in other languages and cultures.

List of abbreviations

N	Neuroticism
E	Extraversion
O	Openness to Experience
A	Agreeableness
C	Conscientiousness
NEO-PI	NEO Personality Inventory
NEO-PI-R	NEO Personality Inventory-Revised
NEO-PI-3	NEO Personality Inventory-3
NEO-FFI	NEO Five-Factor Inventory
NEO-FFI-R	NEO Five-Factor Inventory-Revised
NEO-FFI-3	NEO Five-Factor Inventory-3
NEO-FFI-30	30-item version of the NEO Five-Factor Inventory

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APPENDIX

Table 4. Percentile Ranks for the NEO-FFI-30 Scales in the Population Sample

Raw Score	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
	n=1,895	n=1,896	n=1,894	n=1,895	n=1,897
0	2.0	0.1	0.1	0.1	-
1	4.2	0.1	0.6	0.1	0.1
2	7.0	0.2	1.2	0.1	0.1
3	11.0	0.4	2.0	0.1	0.1
4	16.0	0.8	3.1	0.2	0.2
5	22.0	1.7	4.3	0.3	0.2
6	29.8	3.2	6.3	0.5	0.5
7	39.2	5.9	9.3	0.9	1.3
8	47.2	8.5	13.5	2.6	2.0
9	55.8	12.9	20.4	4.2	2.6
10	64.1	19.9	30.1	6.8	3.9
11	71.3	27.7	41.2	10.6	6.3
12	78.2	35.9	54.6	16.1	10.3
13	83.3	46.6	65.1	21.6	14.3
14	86.7	57.3	73.8	27.9	18.7
15	90.5	68.5	82.4	34.7	23.9
16	93.6	77.4	87.6	44.1	31.6
17	95.7	85.7	91.9	53.4	40.8
18	96.9	91.6	94.8	64.4	54.2
19	98.3	94.6	96.5	75.9	66.4
20	98.9	96.5	97.8	82.9	76.6
21	99.3	98.2	98.9	89.0	84.0
22	99.6	99.2	99.3	93.9	90.2
23	99.8	99.6	99.6	97.7	96.0
24	100.0	100.00	100.00	100.0	100.0
M	9.10	13.68	12.26	16.72	17.76
SD	4.59	3.74	3.81	3.90	3.75

Note. M = mean total sum over all items of the subscale

Table 5. Percentile Ranks by Sex for the Subgroup of 18 to 33-year-old Individuals

Raw score	Males n=226					Females n=245				
	N	E	O	A	C	N	E	O	A	C
0	2.2	0.0	0.4	0.0	0.0	0.8	0.0	0.0	0.0	0.0
1	4.4	0.0	1.3	0.0	0.0	1.2	0.0	0.4	0.0	0.4
2	9.3	0.0	3.1	0.0	0.0	2.0	0.0	0.8	0.0	0.4
3	14.2	0.0	5.3	0.0	0.0	4.9	0.0	1.2	0.0	0.4
4	19.9	0.0	5.3	0.4	0.0	11.0	1.2	2.4	0.0	0.8
5	27.0	0.4	6.2	0.9	0.0	18.4	2.4	4.5	0.0	0.8
6	35.8	1.3	8.4	1.3	0.4	22.9	3.3	5.3	0.4	0.8
7	43.8	2.7	10.7	2.2	1.3	31.8	4.1	7.8	2.4	1.6
8	52.2	4.0	15.1	4.4	2.2	42.0	6.1	12.2	4.5	1.6
9	61.1	5.8	19.1	7.6	3.6	53.5	9.0	19.2	5.7	2.9
10	70.8	9.7	27.1	11.6	7.1	60.4	15.9	26.1	6.9	3.7
11	80.1	15.9	40.4	19.1	11.1	68.2	21.6	36.7	9.8	6.5
12	85.4	20.4	52.9	24.4	13.8	75.5	26.9	50.2	17.1	11.8
13	88.1	27.4	62.2	32.9	19.1	80.4	34.7	59.6	21.6	15.1
14	90.3	44.7	72.9	40.9	28.0	84.9	45.3	67.3	27.8	22.0
15	92.5	54.0	81.3	49.3	35.1	89.0	59.2	77.1	35.1	29.0
16	94.2	65.0	85.3	58.7	44.9	92.2	72.2	84.9	46.1	41.2
17	95.6	76.1	89.8	69.3	53.8	93.9	80.0	90.6	56.7	49.4
18	96.5	88.1	93.8	77.3	67.6	95.1	87.8	93.9	68.2	65.7
19	98.7	92.5	95.1	86.2	78.2	96.7	91.8	94.7	80.0	76.3
20	99.1	95.6	97.8	90.2	84.9	97.1	93.9	96.7	88.2	85.7
21	99.6	97.8	98.7	95.1	90.2	98.4	95.9	98.4	91.8	91.8
22	100.0	98.2	98.7	98.2	96.4	99.6	98.9	99.6	95.5	94.7
23	100.0	99.1	99.6	99.1	99.1	99.6	100.0	99.6	98.4	98.0
24	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
M	8.39	15.01	12.29	15.31	16.63	9.80	14.50	12.71	16.44	16.99
SD	4.49	3.41	4.23	3.93	3.71	4.50	3.81	3.90	3.81	3.60

Note. N = Neuroticism; E = Extraversion; O = Openness to Experience; A = Agreeableness; C = Conscientiousness; M = mean total sum over all items of the subscale

Table 6. Percentile Ranks by Sex for Subgroup of 34 to 49-year-old Individuals

	Males					Females				
Raw score	n=249					n=328	n=329	n=330	n=330	n=329
	N	E	O	A	C	N	E	O	A	C
0	2.8	0.0	0.4	0.4	0.0	0.9	0.0	0.0	0.0	0.0
1	7.6	0.0	0.8	0.4	0.0	2.7	0.0	0.6	0.0	0.0
2	12.0	0.4	1.2	0.4	0.0	4.0	0.0	0.9	0.0	0.0
3	16.5	0.8	3.6	0.4	0.0	7.9	0.0	1.5	0.0	0.0
4	22.1	0.8	4.4	0.4	0.4	13.7	0.3	2.4	0.0	0.3
5	27.7	1.6	7.2	0.4	0.4	17.4	0.9	3.0	0.3	0.3
6	39.8	3.6	10.0	0.8	0.8	23.5	2.4	4.6	0.3	0.9
7	47.0	7.7	14.1	1.2	1.2	33.5	5.2	7.9	0.3	1.2
8	53.0	10.8	18.5	2.8	2.8	42.1	7.9	12.2	2.4	1.8

Table continues on the next page

9	56.6	14.1	24.5	5.6	2.8	50.6	11.6	18.2	3.3	3.0
10	65.1	17.7	33.3	10.4	3.2	59.1	16.1	28.6	6.4	4.8
11	71.5	21.7	43.4	12.9	6.4	65.5	25.5	37.7	11.6	7.6
12	78.3	28.5	54.6	20.5	10.4	75.3	35.0	50.2	17.3	12.1
13	83.5	37.8	64.7	24.9	15.3	80.5	45.6	62.6	21.9	16.7
14	85.5	47.4	71.5	32.1	18.5	85.7	53.8	72.3	27.4	20.3
15	89.2	61.4	80.7	39.8	24.5	90.2	64.7	80.2	35.6	23.9
16	94.0	69.9	85.5	48.6	28.9	93.0	74.8	86.0	43.8	33.6
17	95.2	80.7	90.4	55.4	43.8	95.1	86.0	89.7	55.9	41.2
18	96.8	88.4	92.4	69.9	54.6	96.3	89.4	94.5	64.7	55.8
19	98.8	94.0	94.4	79.9	66.3	97.9	92.4	96.4	75.1	67.3
20	99.2	96.0	95.2	84.3	77.9	98.8	95.4	97.6	83.0	77.6
21	99.6	97.6	98.0	91.6	81.9	99.1	97.9	98.2	90.0	87.3
22	99.6	98.4	98.0	96.0	87.6	99.4	99.4	99.7	94.8	90.3
23	100.0	98.8	98.4	98.0	94.4	99.4	99.7	100.0	99.1	96.7
24	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
M	8.59	14.22	12.15	13.23	17.78	9.68	13.96	12.55	16.67	17.57
SD	4.97	3.99	4.42	4.05	3.86	4.50	3.71	3.76	3.83	3.82

Note. N = Neuroticism; E = Extraversion; O = Openness to Experience; A = Agreeableness; C = Conscientiousness; M = mean total sum over all items of the subscale

Table 7. Percentile Ranks by Sex for Subgroup of 50 to 65-year-old Individuals

Raw Score	Males n=237					Females n=287				
	N	E	O	A	C	N	E	O	A	C
0	5.1	0.0	0.0	0.0	0.0	1.0	0.3	0.0	0.0	0.0
1	7.2	0.0	0.4	0.0	0.0	2.1	0.3	0.0	0.0	0.0
2	11.0	0.0	0.8	0.0	0.0	4.2	0.3	0.7	0.0	0.0
3	16.9	0.0	0.8	0.0	0.0	6.6	0.3	1.0	0.0	0.0
4	23.2	0.8	2.5	0.0	0.0	10.1	1.0	2.4	0.3	0.0
5	30.0	1.3	3.8	0.0	0.0	14.6	1.7	2.8	0.3	0.0
6	39.7	2.1	5.1	0.0	0.0	21.6	3.5	5.2	0.7	0.0
7	50.6	3.4	7.2	0.0	0.8	32.1	7.0	8.0	1.0	0.7
8	59.1	4.2	11.8	2.1	1.7	38.3	9.8	13.2	2.4	1.4
9	67.5	10.5	21.9	3.4	1.7	47.0	15.0	21.6	3.1	1.7
10	75.9	20.3	31.6	5.5	1.7	55.4	21.3	30.0	4.2	3.1
11	79.7	29.1	40.5	10.5	3.8	65.5	30.3	42.5	7.3	4.5
12	84.0	37.1	54.4	14.8	7.6	72.5	39.4	56.8	12.2	8.0
13	88.6	52.3	65.4	20.7	9.7	78.4	53.0	68.6	16.4	11.8
14	89.9	61.2	73.0	27.8	13.5	82.9	66.2	79.8	21.3	14.6
15	93.2	74.7	82.7	35.4	17.3	87.8	76.7	87.1	25.1	19.9
16	95.8	82.7	86.5	45.6	24.5	91.3	83.6	90.9	33.8	27.2
17	97.9	88.6	90.7	55.3	31.2	94.4	91.3	94.4	43.9	33.8
18	98.3	93.7	94.9	65.4	47.3	96.5	95.8	95.5	53.0	42.5
19	98.7	95.8	97.0	75.1	60.3	98.3	96.9	97.6	69.3	56.1
20	98.7	96.6	98.3	83.1	70.9	99.3	98.3	99.3	77.0	67.2
21	99.2	98.3	99.2	87.8	79.3	99.3	99.3	100.0	83.3	75.6
22	99.6	99.6	99.2	93.7	88.2	99.3	99.7	100.0	90.2	84.7
23	100.0	100.0	99.6	97.0	94.5	99.7	99.7	100.0	95.8	95.1
24	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
M	7.90	13.48	12.33	16.77	18.46	10.02	13.09	12.02	17.59	18.52
SD	4.56	3.88	3.72	3.81	3.50	4.47	3.50	3.39	3.88	3.72

Note. N = Neuroticism; E = Extraversion; O = Openness to Experience; A = Agreeableness; C = Conscientiousness; M = mean total sum over all items of the subscale

Table 8. Percentile Ranks by Sex for Subgroup of Individuals over 65 Years of Age

Raw Score	Males					Females				
	n=138					n= 185	n= 186	n= 184	n= 185	n= 185
	N	E	O	A	C	N	E	O	A	C
0	2.9	0.7	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0
1	6.5	0.7	1.4	0.0	0.0	3.2	0.0	0.0	0.0	0.0
2	9.4	0.7	1.4	0.0	0.0	7.0	0.0	0.5	0.0	0.0
3	11.6	2.9	1.4	0.0	0.0	11.9	0.0	0.5	0.0	0.0
4	13.8	3.6	2.9	0.0	0.0	15.1	0.0	2.2	0.0	0.0
5	23.9	5.1	2.9	0.0	0.0	20.5	1.6	3.8	0.0	0.0
6	32.6	5.8	5.1	0.0	0.7	27.0	4.9	7.6	0.0	0.5
7	44.2	10.1	11.6	0.0	2.9	35.1	9.7	8.7	0.0	1.6
8	53.6	13.0	13.0	0.7	3.6	43.2	15.7	12.0	0.0	1.6
9	64.5	19.6	18.1	2.9	4.3	52.4	22.2	19.6	1.6	2.2
10	70.3	31.9	31.9	5.8	4.3	62.2	35.7	34.2	2.7	3.2
11	80.4	42.0	45.7	8.0	6.5	66.5	45.4	47.3	3.8	3.8
12	85.5	53.6	60.1	11.6	10.9	73.5	57.8	63.6	7.6	7.0
13	90.6	66.7	68.8	23.2	16.7	81.6	67.0	72.3	11.4	9.7
14	92.8	73.9	74.6	29.0	18.8	85.4	76.8	80.4	17.3	13.4
15	94.2	81.9	84.8	33.3	25.4	90.3	83.8	87.0	23.2	16.1
16	95.7	87.0	90.6	40.6	29.0	94.1	90.3	93.5	35.1	20.4
17	97.8	90.6	94.2	44.9	38.4	97.8	95.1	97.8	41.1	33.9
18	98.6	94.9	96.4	60.9	58.0	98.4	97.3	98.4	54.6	44.1
19	98.6	97.8	98.6	73.9	67.4	98.9	98.4	99.5	66.5	60.8
20	100.0	98.6	98.6	84.1	76.1	100.0	99.5	100.0	73.0	73.7
21	100.0	99.3	99.3	89.1	84.8	100.0	100.0	100.0	82.7	81.2
22	100.0	99.3	99.3	94.9	90.6	100.0	100.0	100.0	87.6	91.4
23	100.0	99.3	100.0	97.1	93.5	100.0	100.0	100.0	96.8	96.2
24	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
M	8.33	12.21	11.99	17.00	17.69	9.35	11.99	11.71	17.95	18.39
SD	4.16	3.87	3.60	3.72	3.92	4.47	3.35	3.18	3.53	3.45

Note. N = Neuroticism; E = Extraversion; O = Openness to Experience; A = Agreeableness; C = Conscientiousness; M = mean total sum over all items of the subscale