

Personality dimensions measured using the Temperament and Character Inventory (TCI) and NEO-FFI on a Polish sample

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Abstract

The results of two self-administered, paper-and-pencil tests based on biosocial theory of personality have been compared simultaneously: the Temperament and Character Inventory (TCI) and NEO Five Factor Inventory (NEO-FFI). The stability of the personality dimensions was assessed across age, sex and education level samples in a group of 406 Polish adults with major mental diseases excluded by use of PRIME-MD questionnaire. Significant effects of age, sex, and education have been found while comparing personality dimensions in both temperamental (novelty seeking, NS; harm avoidance, HA; reward dependence, RD; persistence, P) and character scales (cooperativeness, C; self-transcendence, ST) in TCI. Among subscales of temperament only NS1, RD4 were stable according to concerning factors. All converted to their age and sex norms NEO-FFI dimensions were stable according to sex. Extraversion scale was changeable depending on age ($p = 0.04$). Neuroticism dimension was a little higher in lower educated group ($p = 0.035$).

To sum up, it was concluded that sex- and age-specific norms for the dimensions of the Polish version of TCI are necessary considering the established significant differences. Particular personality genetic studies should account for age, sex and also educational differences in their methods of associative studies.

Conclusions: In the exploration of personality dimensions on healthy volunteers the Polish version of NEO-FFI corresponds better than TCI to theory of stability and genetic determinants of human personality. As the study included persons with excluded major mental diseases, the sample is appropriate to provide a control group in the research of psychiatric patients using both TCI and NEO-FFI.

Significant Outcomes: TCI scores for persons with excluded mental disease are highly changeable depending on age, sex and education. Adjusted to sex and age scores NEO-FFI corresponded better than TCI to stability and genetic determinants of human personality. Copyright © 2008 John Wiley & Sons, Ltd.

Key words: personality assessment, TCI, NEO-FFI, adults, dimension, age, sex, education, health

Introduction

Although assessing human personality is a complicated task, many authors have taken up this challenge and approached it from a scientific point of view. It is possible to find about 5000 words describing personality traits in English dictionaries (Pervin and John, 2002).

Organizing traits in coherent dimensions was the task of personality researchers in the last decade of the twentieth century. Multidimensional assessment seemed to be especially appealing to scientists involved in neuropsychiatric and genetics surveys. A genetic perspective of personality research requires a detailed

assessment and stable dimensions of personality as our genes limit the influence of environmental factors in human development.

There have been several models classifying temperament and personality. One of the most widely adopted has been that of Cloninger who proposed that there are three genetically homogeneous and independent dimensions of personality: novelty seeking, NS; harm avoidance, HA; reward dependence, RD (Cloninger, 1987). NS is a tendency to respond with intense excitement to novel stimuli, or cues for potential rewards or potential relief of punishment and thereby activating/initiating behavior. HA is defined as a tendency to respond intensively to signals of aversive stimuli, thereby inhibiting/stopping behavior. RD is a tendency to respond intensely to signals of reward, especially social rewards, thus maintaining and continuing particular kinds of behavior. Three temperament dimensions have been speculated to be connected to the neurotransmitter system in animal and human brains: NS primarily would utilize dopamine pathways, HA would utilize serotonin pathways and RD would utilize nor-epinephrine pathways (Cloninger et al., 1993). Cloninger subsequently elaborated his initial Tridimensional Personality Questionnaire (TPQ) into a seven-factor model of personality developing a new questionnaire called the Temperament and Character Inventory (TCI) (Cloninger et al., 1993, 1994). The TCI assesses four temperament dimensions: HA, NS, RD and persistence (P) and three character dimensions: self-directedness, SD; cooperativeness, C; self-transcendence, ST. P had been present in the TPQ as part of the RD-factor. P includes a tendency to persevere in behavior that has been associated with either a reward or relief from punishment. NS, HA and RD dimensions represent higher order personality dimensions, composed of similarly motivated but differently expressed behavior. In accordance with earlier they are divided into subscales (Cloninger et al., 1994). The possible answers to all of the 240 TCI items include 'yes' or 'no'. The NEO Five Factor Inventory (NEO-FFI) personality questionnaire used in the present study is based on the theory of five main and stable dimensions of personality: Neuroticism, Extraversion, Openness (Intellect/Imagination), Agreeableness, and Conscientiousness (Costa and McCrae, 1990). The so-called 'Big Five' hypothesis came from a lexical theory of traits. Its authors – Costa and McCrae – emphasized fixed personality traits after the age of 30 (McCrae and Costa, 1994). The NEO

PI-R is a 240-item inventory and not only does it measure the 'Big Five' factors, but it also takes into account the six 'facets' (subordinate dimensions) of each main factor. Costa and McCrae have also created the NEO-FFI, a 60-item truncated version of the NEO PI-R called NEO-FFI (Srivastava, 2006). Persons examined using this shortened version mark their answers on a five-point scale.

The major aim of this study was to evaluate the stability of dimensional assessment of personality in different age, sex and education groups using TCI. Other aims were to compare the properties of TCI and NEO-FFI dimensions as the two inventories which were built and based on different theories and also assessing their usefulness in future genetic studies. It is worth emphasizing that this study is unique in analyzing both TCI and NEO-FFI. The other studies concerning both measures focused either on a small group of psychiatric outpatients or on analyzed gene association but not on measured personality dimensions (De Fruyt et al., 2000; Samochowiec et al., 2004). It is also one of the few studies testing subjects with excluded mental disorders and considering their education level.

Material and methods

Four hundred and six (173 males and 233 females) white Caucasian unrelated persons of Polish descent above the age of 18 (mean age = 38.51 ± 15.08) comprised the group. The subjects were recruited to represent a cross-section of Szczecin population (Poland) in terms of sex, age and education from the visitors of an emergency ambulance service and a blood donation unit in Szczecin. Major psychiatric disorders were excluded in face-to-face interview with an educated general practitioner and using the PRIME-MD questionnaire (Spitzer et al., 1999). All the participants signed a formal written consent after the nature of the study had been explained to them. The study protocol was approved by the Ethics Committee of the Pomeranian Medical University.

The original English versions of the TCI were translated into Polish by one of the investigators and back-translated blindly to the original English scale by a professional English translator. The original version and the back-translation were compared and corrections were made accordingly. The translation was tested in a pilot study of 30 persons specially selected according to their age, sex and education. After that the second version was subjected to linguistic correction

and was tested on 10 persons with secondary education and age between 50 and 65 years (Hornowska, 2004). This third version was used in validation and all other studies on the Polish population (Zakrzewska et al., 2001). None of these studies has so far managed to describe such a big cohort of subjects that would be large enough in different age groups.

The Polish version of NEO-FFI was developed and validated in 1995 and the authors published all the details concerning the translation, validation and norms in their guide (Zawadzki et al., 1998).

Statistical analysis

The data were analyzed with SPSS 9.0 (1999). The subjects were divided into subgroups according to their age, sex and education level. On the basis of the participants' age three groups were formed: subjects 18–29 years old, 30–59 years old and the group of people above 60. Original scores of NEO-FFI were converted according to their age and sex norms before the next calculations (Zawadzki et al., 1998). Differences in original TCI scores and converted NEO-FFI scores were compared with one-way analysis of variance (ANOVA). Sex, age and education were independent variables in the analyses. The *post hoc* Tukey tests were performed to assess the significance of differences between the analyzed age, sex and education groups. To analyze education three groups were defined: less educated subjects with fewer than 12 years of education ($n = 76$) and subjects with the secondary ($n = 238$) and university education ($n = 91$). The last two groups were next considered together as better educated ($n = 319$) because no significant differences in personality dimensions between them were found and also there were many university students among subjects defined in the beginning as secondary educated. Multivariate analysis ANOVA including sex and age interaction were performed.

Results

The results of analysis mean scores, standard deviations for the whole group and samples depending on sex in respective age groups are presented in a tabular form in Table 1 with TCI temperament scales, in Table 2 showing TCI character scales and in Table 3 presenting NEO-FFI dimensions.

TCI temperament dimensions

Differences in scores were recorded between women and men and also between respective age groups. NS

higher ordered dimension decreased with age, especially in men ($p < 0.001$). The subscale of NS Explorative Excitability (NS1) just opposite to the main scale and other NS subscales increased distinctly with age in both sexes, and NS1 had the highest value in women above 65 ($p < 0.00001$). Subscale of Impulsiveness (NS2) also tended to increase with age but without statistical significance. The Extravagance (NS3) subscale was the highest in the group below 30 years old and diminished with age, more distinctly in men ($p < 0.0001$). Similarly, Disorderliness (NS4) also decreased with age in men ($p = 0.004$). HA higher ordered scale and also all its subscales, HA1–HA4, were significantly higher in women in comparison to men ($p < 0.001$). The difference between sexes diminished with age, because of the increasing values of HA in older men. The scores of all four HA subscales increased with age in men, particularly Fear of Uncertainty (HA2) ($p < 0.001$) and Fatigability (HA4) ($p < 10^{-6}$). Women scored higher than men in RD main scale ($p < 0.001$) and its subscale Sentimentality (RD1), which was especially distinctive in the group of participants below 30. Subscale Attachment (RD3) decreased with age in both sex groups ($p < 0.001$). P had the highest value in the middle-aged groups, then it decreased ($p = 0.02$).

TCI character dimensions

Additionally, many significant differences were found in character dimension of TCI (see Table 2). C was higher in woman than in men ($p < 0.001$). Its subscale Empathy (C2) decreased with age, especially in females ($p < 0.001$), opposite to Compassion (C4) which values increased with age ($p = 0.014$). Higher ordered ST and its subscales, ST2 and ST3, increased distinctly with age in women and were the highest in women older than 60 years old ($p < 0.001$).

NEO-FFI dimensions

The explored main dimensions of NEO-FFI were stable with age and sex subgroups. No statistically significant differences among scores of the investigated subgroups were found in Neuroticism, Openness, Agreeableness and Conscientiousness scales. Only Extraversion slightly decreased in groups above 60 ($p = 0.04$). Unlike HA in TCI, the Neuroticism in NEO-FFI seemed to increase in female but not in male groups.

Multivariate analysis

The results of multivariate analysis are presented in Table 4. It is remarkable that the middle aged group

Table 1. TCI temperament dimensions and subscales in whole group and by sex- and age-subgroups, means, standard deviations (SDs) and their *p*-values

	Mean ± SD <i>n</i> = 406	Sex	Age group			<i>p</i> (age) (df = 402)	<i>p</i> (sex) (df = 403)
			<30 Males <i>n</i> = 67 Females <i>n</i> = 90	30–60 Males <i>n</i> = 76 Females <i>n</i> = 118	>60 Males <i>n</i> = 30 Females <i>n</i> = 25		
NS Novelty Seeking	19.68 ± 5.11	Males	21.63 ± 1.29	18.67 ± 1.39	17.20 ± 1.28	<0.001	0.831
		Females	19.92 ± 1.35	19.77 ± 1.37	18.20 ± 1.40		
HA Harm Avoidance	14.78 ± 6.58	Males	10.99 ± 5.66	13.45 ± 6.46	16.50 ± 5.41	0.011	<0.001
		Females	16.30 ± 6.94	15.87 ± 6.19	17.20 ± 6.03		
RD Reward Dependence	14.67 ± 3.26	Males	13.73 ± 3.56	13.80 ± 2.95	13.90 ± 2.77	0.104	<0.001
		Females	16.22 ± 3.13	14.80 ± 2.97	14.44 ± 3.64		
P Persistence	4.27 ± 1.75	Males	4.19 ± 1.84	4.57 ± 1.64	3.55 ± 1.70	0.022	0.900
		Females	4.28 ± 1.81	4.35 ± 1.62	3.76 ± 2.11		
NS1 Explorative Excitability	5.88 ± 2.16	Males	4.79 ± 1.78	5.64 ± 2.01	7.08 ± 1.47	<10 ⁻⁵	0.804
		Females	6.07 ± 2.23	7.06 ± 2.30	11.13 ± 2.03		
NS2 Impulsiveness	4.65 ± 2.10	Males	4.49 ± 2.03	4.78 ± 2.04	5.05 ± 1.88	0.051	0.926
		Females	4.24 ± 2.21	4.77 ± 2.14	5.24 ± 1.92		
NS3 Extravagance	5.23 ± 2.17	Males	5.58 ± 2.02	4.51 ± 2.25	3.70 ± 1.72	<10 ⁻⁵	0.022
		Females	5.68 ± 2.00	5.59 ± 2.22	4.32 ± 1.82		
NS4 Disorderliness	3.90 ± 1.84	Males	4.79 ± 1.68	3.91 ± 1.81	3.65 ± 2.06	0.004	0.071
		Females	3.87 ± 1.77	3.47 ± 1.73	3.80 ± 2.29		
HA1 Worry/Pessimism	4.03 ± 2.27	Males	3.16 ± 2.11	3.75 ± 2.20	4.20 ± 2.12	0.459	0.012
		Females	4.57 ± 2.52	4.17 ± 2.13	4.48 ± 2.10		
HA2 Fear of Uncertainty	3.88 ± 1.99	Males	2.48 ± 1.63	3.59 ± 1.86	4.35 ± 1.81	<0.001	<0.001
		Females	4.21 ± 2.12	4.50 ± 1.85	4.04 ± 1.77		
HA3 Shyness	3.56 ± 2.09	Males	2.78 ± 1.94	3.04 ± 2.15	3.20 ± 1.58	0.765	0.001
		Females	4.12 ± 1.94	4.01 ± 2.06	3.36 ± 2.29		
HA4 Fatigability	3.33 ± 2.21	Males	2.57 ± 1.92	3.07 ± 2.11	4.75 ± 1.83	<10 ⁻⁶	0.048
		Females	3.42 ± 2.39	3.19 ± 1.89	5.32 ± 2.70		
RD1 Sentimentality	6.63 ± 2.09	Males	5.91 ± 2.24	6.08 ± 1.90	6.75 ± 2.02	0.545	0.005
		Females	6.97 ± 2.06	7.06 ± 1.90	6.88 ± 2.52		
RD3 Attachment	4.75 ± 1.67	Males	4.81 ± 1.60	4.62 ± 1.43	3.95 ± 1.61	<0.001	0.077
		Females	5.47 ± 1.78	4.45 ± 1.62	4.52 ± 1.73		
RD4 Dependence	3.30 ± 1.37	Males	3.01 ± 1.29	3.11 ± 1.39	3.20 ± 1.28	0.374	0.126
		Females	3.74 ± 1.35	3.31 ± 1.37	3.04 ± 1.40		

Note: df, degree of freedom.

Table 2. TCI character dimensions and subscales in whole group and by sex- and age-subgroups, means, standard deviations (SDs) and their *p*-values

	Mean ± SD <i>n</i> = 406	Sex	Age group						<i>p</i> (age) (df = 402)	<i>p</i> (sex) (df = 403)
			<30		30–60		>60			
			Males <i>n</i> = 67	Females <i>n</i> = 90	Males <i>n</i> = 76	Females <i>n</i> = 118	Males <i>n</i> = 30	Females <i>n</i> = 25		
C Cooperativeness	32.1 ± 6	Males	30.12 ± 7.02	30.5 ± 6.9	30.85 ± 5.25	0.706	<0.001			
		Females	34.18 ± 4.91	33.08 ± 4.67	31.92 ± 6.12					
SD Self-directedness	29.1 ± 6.8	Males	28.55 ± 6.29	27.28 ± 7.2	28.7 ± 6.05	0.347	0.156			
		Females	30.47 ± 6.99	30.03 ± 6.59	27.56 ± 5.7					
ST Self-transcendence	15.2 ± 5.9	Males	14.03 ± 5.77	15.63 ± 5.75	15.25 ± 6.37	0.002	0.027			
		Females	14.47 ± 5.53	14.96 ± 5.95	20.29 ± 5.73					
C1 Social Acceptance	6.72 ± 1.5	Males	6.52 ± 1.71	6.42 ± 1.85	6.25 ± 2.36	0.298	0.028			
		Females	7.02 ± 1.14	6.93 ± 1.16	6.48 ± 1.73					
C2 Empathy	4.72 ± 1.3	Males	4.5 ± 1.37	4.26 ± 1.2	4.05 ± 1.19	<0.001	<0.0001			
		Females	5.39 ± 1.16	4.78 ± 1.17	4.56 ± 1.08					
C3 Helpfulness	6.07 ± 1.4	Males	6.06 ± 1.52	5.72 ± 1.4	5.3 ± 0.98	0.017	0.003			
		Females	6.42 ± 1.37	6.19 ± 1.28	5.96 ± 1.21					
C4 Compassion	7.74 ± 2.5	Males	6.67 ± 3.05	7.63 ± 2.84	8.25 ± 1.71	0.014	0.029			
		Females	7.92 ± 2.18	8.03 ± 2.09	8.6 ± 2.2					
C5 Integrated Conscience	6.88 ± 1.6	Males	6.19 ± 1.84	6.46 ± 1.74	7 ± 1.45	0.836	0.015			
		Females	7.42 ± 1.32	7.21 ± 1.09	6.38 ± 1.76					
SD1 Responsibility	5.66 ± 1.9	Males	5.48 ± 1.77	5.3 ± 1.96	5.75 ± 1.55	0.27	0.575			
		Females	6.13 ± 1.79	5.75 ± 1.95	5.04 ± 2.03					
SD2 Purposefulness	5.51 ± 1.6	Males	5.66 ± 1.72	5.26 ± 1.68	5.55 ± 1.05	0.053	0.938			
		Females	5.83 ± 1.7	5.39 ± 1.57	5.2 ± 1.38					
SD3 Resourcefulness	3.56 ± 1.4	Males	3.66 ± 1.33	3.39 ± 1.38	3.55 ± 1.39	0.339	0.579			
		Females	3.59 ± 1.56	3.73 ± 1.3	3 ± 1.35					
SD4 Self-acceptance	6.31 ± 2.5	Males	5.64 ± 2.48	5.71 ± 2.66	6.4 ± 2.3	0.43	<0.01			
		Females	6.64 ± 2.4	6.67 ± 2.4	6.96 ± 2.75					
SD5 Congruent Second Nature	8.11 ± 2.4	Males	8.12 ± 2.17	7.61 ± 2.59	7.45 ± 2.35	0.12	0.226			
		Females	8.33 ± 2.35	8.53 ± 2.21	7.36 ± 2.51					
ST1 Self-forgiveness	4.89 ± 2.4	Males	5.24 ± 2.44	4.96 ± 2.27	4.4 ± 2.48	0.496	0.517			
		Females	4.86 ± 2.4	4.56 ± 2.46	5.76 ± 2.57					
ST2 Transpersonal Identification	3.55 ± 2.1	Males	3.18 ± 2.17	4.01 ± 2.11	4.6 ± 2.54	<10 ⁻⁶	0.869			
		Females	2.8 ± 1.88	3.4 ± 1.85	5.72 ± 2.07					
ST3 Spiritual Acceptance	6.71 ± 3	Males	5.61 ± 2.76	6.66 ± 3.13	6.25 ± 3.13	0.021	<0.001			
		Females	6.73 ± 2.69	7.03 ± 3.23	8.63 ± 2.63					

Note: df, degree of freedom.

Table 3. NEO-FFI dimensions and subscales in whole group and by sex- and age-subgroups, means, standard deviations (SDs) and their *p*-values

	Mean ± SD n = 406	Sex	Age group			<i>p</i> (age) (df = 402)	<i>p</i> (sex) (df = 403)
			<30	30–60	>60		
			Males n = 67 Females n = 90	Males n = 76 Females n = 118	Males n = 30 Females n = 25		
Neuroticism	4.67 ± 2.20	Males	4.94 ± 2.03	4.69 ± 2.14	4.95 ± 2.48	0.44	0.37
		Females	4.1 ± 2.4	4.45 ± 2.24	5.14 ± 2.05		
Extraversion	5.93 ± 2.00	Males	5.91 ± 1.61	6.46 ± 2.23	5.55 ± 1.96	0.04	0.55
		Females	6.65 ± 2.21	5.68 ± 1.7	5.05 ± 2.26		
Openness	5.52 ± 1.99	Males	5.42 ± 1.82	5.51 ± 1.86	4.95 ± 1.82	0.13	0.70
		Females	4.9 ± 2.1	5.92 ± 2.04	5.41 ± 2.32		
Agreeability	5.84 ± 1.85	Males	5.48 ± 1.62	5.66 ± 1.69	6.05 ± 1.99	0.86	0.26
		Females	6.35 ± 1.79	5.93 ± 1.99	5.86 ± 2.12		
Conscientiousness	6.05 ± 1.81	Males	6.03 ± 2.02	6 ± 1.85	6.8 ± 1.7	0.86	0.12
		Females	5.9 ± 2.45	6.08 ± 1.59	5.55 ± 1.5		

Note: df, degree of freedom.

Table 4. Multivariate analyses including the different independent variables tested (sex, age) – only significant associations: means, standard deviations (SDs) and their *p*-values

Personality dimension	Sex	Age group			<i>p</i> (df = 399)
		<30	30–60	>60	
		Males n = 67 Females n = 90	Males n = 76 Females n = 118	Males n = 30 Females n = 25	
NS Novelty Seeking	Males	21.63 ± 1.29	18.67 ± 1.39	17.20 ± 1.28	0.03
	Females	19.92 ± 1.35	19.77 ± 1.37	18.20 ± 1.40	
HA Harm Avoidance	Males	10.99 ± 5.66	13.45 ± 6.46	16.50 ± 5.41	0.035
	Females	16.30 ± 6.94	15.87 ± 6.19	17.20 ± 6.03	
HA2 Fear of Uncertainty	Males	2.48 ± 1.63	3.59 ± 1.86	4.35 ± 1.81	0.004
	Females	4.21 ± 2.12	4.50 ± 1.85	4.04 ± 1.77	
ST Self-Transcendence	Males	14.03 ± 5.77	15.63 ± 5.75	15.25 ± 6.37	0.014
	Females	14.47 ± 5.53	14.96 ± 5.95	20.29 ± 5.73	
C5 Integrated Conscience	Males	6.19 ± 1.84	6.46 ± 1.74	7 ± 1.45	0.015
	Females	7.42 ± 1.32	7.21 ± 1.09	6.38 ± 1.76	
ST2 Transpersonal Identification	Males	3.18 ± 2.17	4.01 ± 2.11	4.6 ± 2.54	0.036
	Females	2.8 ± 1.88	3.4 ± 1.85	5.72 ± 2.07	

Note: df, degree of freedom.

Table 5. TCI and NEO-FFI scales in lower and higher educated persons: only significant associations – means with their standard deviations (SDs) and their *p*-values

		NS2	NS4	HA2	HA3	C2	C5
BE <i>N</i> = 320	mean ± SD	4.53 ± 2.15	3.80 ± 1.81	4.00 ± 2.03	3.72 ± 2.10	4.78 ± 1.31	7.00 ± 1.48
LE <i>N</i> = 76	mean ± SD	5.13 ± 1.80	4.32 ± 1.92	3.38 ± 1.77	2.87 ± 1.90	4.46 ± 1.08	6.37 ± 1.75
<i>p</i> (<i>df</i> = 393)		0.013	0.030	0.011	0.002	0.026	0.002

Note: LE, subjects less educated <12 years; BE, subjects with better education >12 years; NEU, neuroticism; *df*, degree of freedom.

was mostly homogenous. Only middle aged females stand out because of extreme values of Fear of Uncertainty (HA2). The group of young males achieved extremely high score in NS and extremely low scores in HA, HA2 subscales and ST and C5 subscales. The young females scored the highest in HA and character subscale C5 and also they had the lowest Transpersonal identification ST2. The elderly males were extremely low in NS. The elderly females were extremely high in HA and ST, particularly in its ST2 subscale.

Education

The differences between the higher and the less educated groups were found – data is shown in Table 5. The females were better educated than males. 90.7% of them (*n* = 215) had secondary or university education in comparison with 67.1% of males (*n* = 104). The group with better education scored higher in HA2 and HA3 subscales and also in two of the main character dimensions with some of its subscales: SD with SD1, SD3, SD4, SD5; C with C2 and C5.

The less educated group scored higher in temperament subscales NS2, NS3 and NS4. This group also scored higher in Neuroticism of NEO-FFI.

Discussion

The presented analysis have been performed to evaluate the distributions of personality traits assessed on the basis of age, sex and education by means of two most commonly used inventories in their Polish versions. The tested cohort represents, with some limitation discussed later, persons above 18 years of age residing in a city with a population of approximately 400,000 and, to the best of our knowledge, it was the largest study sample analyzed up-to-date in Poland. Contrary to previous studies both methods: a face-to-face interview and a modern questionnaire were used to exclude mental disorders in the tested group. The

aims of the study were to collect personality dimensions data for future genetic studies of personality and to evaluate a changeability of scores distribution assessed on the basis of age, sex and education level using two questionnaires simultaneously. All three variables i.e. age, sex and education showed independent effects on many personality dimensions evaluated by the TCI, but not by the NEO-FFI.

Some results obtained from TCI mean scores are indeed surprising. The differences between mean HA scores for young males (10.99) and females (16.30) are violently high, as well as the large difference between HA mean scores in young (10.99) and elderly (16.5) male subjects. Even if women scored higher in most previous studies [see meta-analysis by Miettunen et al. (2007)] ascribing themselves as more fearful, pessimistic, tense, shy and aesthetic than men it has not explained this extreme difference in HA scores. Young women visiting medical facilities can be speculative or hypersensitive or to sub-threshold depressive symptoms as well. These would not have been detected with the PRIME questionnaire. Also, in this study group depression and anxiety measures assessing symptoms were used: Beck Depression Scale (BDI), the Spielberger State-Trait Anxiety Inventory (STAI). BDI correlated highly with HA of TCI (ratio = 0.4; *p* < 0.00001). Women in the study also ascribed themselves as more dependent and sensitive (RD). These differences for HA and also in RD might also occur with upbringing influences and social stereotypes toward females and males, which can change realistic self-evaluation in a younger age.

In males, in contrast to females, all HA and its subscales increased with age, especially their feeling of tension and fatigability. The elderly males group HA score was as high as in the young females group.

We also found that Explorative excitability (NS1) was increasing with age, with the highest mean result

SD1	SD3	SD4	SD5	ST2	C	SD	NEU
5.76 ± 1.85	3.65 ± 1.39	6.46 ± 2.49	8.26 ± 2.42	3.37 ± 1.97	32.46 ± 5.78	29.65 ± 6.69	4.48 ± 2.20
5.24 ± 2.01	3.21 ± 1.37	5.68 ± 2.55	7.49 ± 1.96	4.30 ± 2.60	30.80 ± 6.49	26.89 ± 6.60	5.19 ± 2.12
0.039	0.005	0.008	0.002	0.007	0.025	0.001	0.035

in the group over 60. This result stands in contrast to other NS subscales NS3, NS4 and the NS main scale. The description of people with high scores of NS1 as 'sensation seekers' and 'easy bored with monotony' (Cloninger et al., 1994) would rather suggest a temperamental feature of young people. According to the authors of questionnaire and other empirical results (Cloninger et al., 1993; Brändström et al., 2001) NS1 decreases significantly with age. Among the 'volunteers' who took part in the study there were probably people with higher NS, particularly in NS1 subscale, and this result could have been accidental. Besides that, the group over 60 had the smallest number of participants and it should have been enlarged.

As for other dimensions of NS, the Disorderliness (NS4) indeed decreased until 60, but in the oldest group it was impossible to assess it because of a large dispersion of scores. Also, some other temperament dimensions, such as HA (especially its subscales HA4 and HA2), P and Attachment (RD3) significantly increased in the older age group over 60. These results are in accordance with studies of other non-Polish groups (Duijsens et al., 2000; Sung et al., 2002; Kijima et al., 2000).

In TCI character scales women describe their bigger cooperativeness, compassion, helpfulness, empathy and consider themselves to be more self-accepted, spiritual and united with universe. All the earlier mentioned differences between men and women are stated by using TCI scores only but not converted scores of NEO-FFI. According to Cloninger's theory of character only ST and its subscales increased with age of subjects in contrast to some subscales of C which significantly decreased. It is hard to discuss these results, which are clearly contrary to theoretical assumptions. According to Polish analysis of TCI reliability, C had an especially low Cronbach Coefficient Alpha (Zakrzewska et al.,

2001). Although many validity studies were published in acknowledged professional journals, the method of collecting subjects seems to be the most controversial aspect of study procedure. In most previous studies these tests had a substantially smaller sample size and/or the samples characteristically do not represent the general population, but rather selected subpopulations, such as students or patients (e.g. Zakrzewska et al., 2001; Duijsens et al., 2000; Sung et al., 2002; Kijima et al., 2000). The French TCI had high Cronbach Coefficient Alpha although age and sex of French samples were not analyzed (Pelissolo and LePine, 2000). The Spanish version was analyzed only on a sample of psychiatric patients (Gutierrez et al., 2001). The Finnish study considered a sample of participants born in the same year but it confirmed sex differences in TCI scores (Miettunen et al., 2004). The study of the Taiwan sample confirmed evident differences between males and females and correlation of NS and HA with age (Chen et al., 2002). Other studies on larger samples e.g. Spanish, French and Australian (Gutierrez et al., 2001; Pelissolo and LePine, 2000; Parker et al., 2003b) did not consider such relationships.

In the present study of two personality questionnaires in the Polish version the converted to their sex and age norms NEO-FFI scores seem to correspond better with the assumption about stability of human personality dimensions and genetic factors influencing them. All the dimensions scores except for Extraversion were congruent with the literature (McCrae et al., 1999). The validation of the NEO-FFI was performed in Poland and age and sex norms were established (Zawadzki et al., 1998). The higher score of Extraversion in the male sample between 30 and 60 years of age is probably influenced by socio-economic background in Poland, where younger than 30 years of age males have comparatively poor possibilities to accomplish their aims in life.

In this study, education influenced TCI (HA, C, SD) and Neuroticism NEO-FFI scores. Also, the Chinese study found that higher education ('occupational level') of subjects is associated with higher scores in HA and SD (Parker et al., 2003a). Aside from an effect of better education on self-evaluation abilities also the possibility of misunderstanding some items should be considered.

We are aware of our study limitations: the volunteers do not reflect a cross-section of the society accurately, the youngest group is overrepresented and the oldest subjects group is too small when compared with population of the town (Public Information Bulletin, 2007). Also another methodological limitation is that both questionnaires have not been analyzed by the same method: direct scoring for the TCI, and transformation according to previous norms for the NEO-FFI. So it is logical that final transformed scores have less variability than TCI untransformed scores.

The diversity of scores in studied subgroups in the Polish version of the TCI restricts the usefulness of applying the test in studies of genetic factors influencing personality. In the case of large cohort studies, age and sex-matched norms are needed. Inappropriate understanding and interpretation of self-evaluation tests contribute to non-replicable results of genetic studies. We pointed out the lack of Polish norms for TCI and the necessity of their creation, particularly due to the large number of ongoing genetic studies.

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Declaration of Interests

The authors have no competing interests.

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