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Circumplex structure of personality traits measured with the IPIP-45AB5C questionnaire in Poland

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ABSTRACT

According to the Abridged Big Five-Dimensional Circumplex (AB5C) model (Hofstee, De Raad, & Goldberg, 1992), there are five basic personality traits (similar to the hierarchical Five Factor Model; Costa & McCrae, 1992); however, the lower-level traits are organized in a circular way (in contrast to the hierarchical Five Factor Model). This study was conducted to verify the two main hypotheses assumed by the AB5C model: (1) the basic traits conceptualized in the hierarchical and circular models are similar, and (2) the lower-order traits of the AB5C model are circularly organized. The research was conducted in Poland on a group of 913 participants. The first hypothesis was verified in an analysis of multi-trait multi-method matrix. The second hypothesis was verified in second-order confirmatory factor analysis.

1. Introduction

The Five Factor Model (FFM) of personality is one of the most often used taxonomies of traits. This model assumes five basic personality dimensions that, together with the appropriate lower-order traits, form a hierarchical structure (e.g., Barbaranelli & Caprara, 2002; Costa & McCrae, 1992, 1995, 2003; DeYoung, Quilty, & Peterson, 2007; Goldberg, 1990; McCrae & John, 1992). It means that each basic personality factor consists of several facets that are independent from the other factors. In the model of Costa and McCrae (1992, 1995), which is the most popular version of the FFM, there are 30 facets and each of the five basic traits consists of six facets. The hierarchical structure of the FFM has been verified with factor analysis. However, those verifications were rarely successful. The problem that is most often encountered is the cross-loading of the facets (see McCrae & Costa, 2003; McCrae, Zonderman, Costa, Bond, & Paunonen, 1996).

The Abridged Big Five-Dimensional Circumplex model (AB5C), developed by Hofstee, De Raad, and Goldberg (1992), and later modified (mainly by new conceptualizations of many facets) by Goldberg (1999), proposes a different structure of facets. Specifically, the AB5C model differs from the hierarchical FFM of Costa and McCrae (1992) in three aspects. First, the AB5C model was developed within the lexical tradition rather than the questionnaire approach; therefore, this model includes the following five factors: Extraversion (designated as factor I), Agreeableness (factor II), Conscientiousness (factor III), Emotional Stability (as opposed the Neuroticism in the FFM model, factor IV), and Intellect (rather than the Openness to Experience in the FFM model, factor V).

Second, each factor is composed of 9 facets (in contrast to the six facets in the FFM). Thus, there are a total of 45 facets in the AB5C model (in contrast to the 30 facets in the FFM). These five factors and their facets are presented in Fig. 1. The factors are connected to their corresponding facets with solid lines.

Third, most of these facets are blends of basic factors and do not belong solely to one factor. In the total set of 45 facets, there are only five core facets that are related to only a single factor (each basic factor has one core facet). The remaining facets are blends of two factors. Thus crossloadings of the facets on the factors are a consequence of this model's main thesis, which states that elements from the lower level of trait organization are defined as blends of pairs of the five basic traits.

This organization of lower-level traits in the AB5C model can be described by the following regularities:

(1) Although one could also think about lower-level traits as being defined by the combinations of three or more basic factors, to cover the most relevant personality traits at the lower-order level, it is sufficient to consider the facets that are defined as the blends of only two basic factors.
(2) Assuming that all of the five basic factors are bipolar, it is possible to distinguish four bipolar facets that are defined as the blends of every two factors. For example, consider the facets described as blends of factors I and II. Two of these

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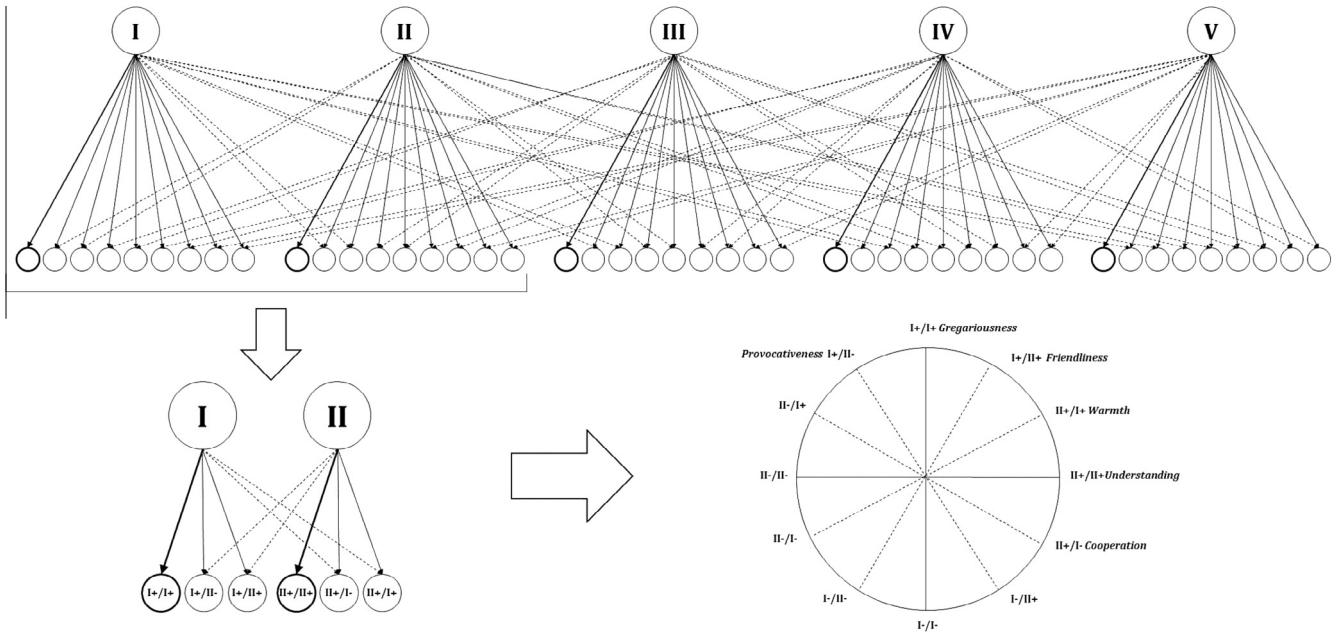

Fig. 1. Schema of the whole circular model (upper section of the illustration) and the system of lower-level traits (facets) of factors I (Extraversion) and II (Agreeableness). The lower left-hand side of the schema presents the system of loadings (solid lines) and cross-loadings (dotted lines) of those facets. The lower right-hand side of the schema presents them in a circumplex.

facets are facets of factor I, and two are facets of factor II. The relationships between the facets and the factors are as follows: the first facet of factor I is also characterized by the positive pole of factor II (this facet can be symbolically labeled I+/II+ vs. I−/II−), whereas the second facet of factor I – by the negative pole of factor II (I+/II− vs. I−/II+). Analogously, the first facet of the factor II is also characterized by the positive pole of factor I (II+/I+ vs. II−/I), and the second facet of factor II – by the negative pole of factor I (II+/I− vs. II−/I+). Additionally, there are core facets of each of the factors that belong to only one factor (i.e., I+/I+ vs. I−/I− and II+/II+ vs. II−/II−). The configuration of loadings and cross-loadings of the two first factors (I and II) is presented in the lower left-hand side of Fig. 1.

(3) The facets distinguished in the manner explained above can be located on the circumplex. The lower right-hand side of picture 1 shows an example circle that describes the facets related to factors I and II.

To continue the example of the circle built by first two factors one can say the following: Trait I+/I+ vs. I−/I− (Gregariousness) is a core facet of factor I (Extraversion), and trait II+/II+ vs. II−/II− (Understanding) is a core facet of factor II (Agreeableness). Those facets are present in every circumplex, constituted by factors I or II, respectively. Provocativeness (I+/II− vs. I−/II+) and Friendliness (I+/II+ vs. I−/II−) are facets of Extraversion, but the former is related to low Agreeableness (II), while the latter is related to high Agreeableness (II). Warmth (II+/I+ vs. II−/I−) is a facet of Agreeableness (II) that is related to high Extraversion, while Cooperation (II+/I− vs. II−/I+) is a facet of Agreeableness (II) that is related to the negative pole of Extraversion (see Table 1).

The method described above produces a set of 10 circumplexes (because there are 10 possible combinations of basic traits pairs) that contain 40 blended facets and 5 core facets. These facets are enumerated in Table 1.

From the historical perspective, it is notable that the first version of the model was published by Hofstee et al. (1992) who described the model in the lexical approach. Later, the model was used as a framework for interpreting and clarifying differences and relationships between several of the Big Five models and other trait concepts (Johnson, 1994a,b; Johnson & Ostendorf, 1993). As those studies mainly employed the lexical data (De Raad & Hofstee, 1993), the names (and meanings) of the particular facets were usually derived from the adjectives with the highest loadings. Consequently, the psychological meanings of the facets varied to some extent from study to study.

In this situation Goldberg (1999) proposed a type of synthesis of the lexical approach wherein the AB5C model was developed, and the psychometric approach. Namely he defined the facets of the AB5C and operationalized them in questionnaire (IPIP-45AB5C) within the International Personality Item Pool (IPIP) project.

This instrument initiated a new chapter in the empirical testing of the AB5C model. Backström, Larsson, and Maddux (2009) confirmed the model in Sweden; however, these authors conducted a first-order CFA that introduced the facet-scales and five factors to the model. Our study is not a simple Polish replication but rather a methodological extension of the study of Backström et al. (2009) and next step in validation of the AB5C model.

2. The aim of our study

The aim of our study was to test the personality structure predicted by the AB5C model in Poland using a Polish version of the IPIP-45AB5C questionnaire. Here, we tested the structure predicted by the model with second-order confirmatory factor analysis (CFA) for the first time.

We formulated two main hypotheses: (1) on the level of basic traits, the IPIP-AB5C measures the same factors as the Revised NEO Personality Inventory (NEO-PI-R) of Costa and McCrae (1992), a questionnaire developed to measure five basic traits in FFM; and (2) on the lower-order level, the traits are organized in the manner predicted by the AB5C model. The first hypothesis was verified by analyzing the multi-trait multi-method matrix (MTMM). The second hypothesis was verified using second-order confirmatory factor analysis (CFA).

Table 1
Personality facets in the Abridged Big Five Dimensional Circumplex – International Personality Item Pool version (Goldberg, 1999).

Factor	Facet	
Factor I Extraversion	I+/I+ vs. I−/I−	Gregariousness
	I+/II+ vs. I−/II−	Friendliness
	I+/III+ vs. I−/III−	Assertiveness
	I+/IV+ vs. I−/IV−	Poise
	I+/V+ vs. I−/V−	Leadership
	I+/II− vs. I−/II+	Provocativeness
	I+/III− vs. I−/III+	Self-disclosure
	I+/IV− vs. I−/IV+	Talkativeness
	I+/V− vs. I−/V+	Sociability
Factor II Agreeableness	II+/II+ vs. II−/II−	Understanding
	II+/I+ vs. II−/I−	Warmth
	II+/III+ vs. II−/III−	Morality
	II+/IV+ vs. II−/IV−	Pleasantness
	II+/V+ vs. II−/V−	Empathy
	II+/I− vs. II−/I+	Cooperation
	II+/III− vs. II−/III+	Sympathy
	II+/IV− vs. II−/IV+	Tenderness
	II+/V− vs. II−/V+	Nurturance
Factor III Conscientiousness	III+/III+ vs. III−/III−	Conscientiousness
	III+/I+ vs. III−/I−	Efficiency
	III+/II+ vs. III−/II−	Dutifulness
	III+/IV+ vs. III−/IV−	Purposefulness
	III+/V+ vs. III−/V−	Organization
	III+/I− vs. III−/I+	Cautiousness
	III+/II− vs. III−/II+	Rationality
	III+/IV− vs. III−/IV+	Perfectionism
	III+/V− vs. III−/V+	Orderliness
Factor IV Emotional Stability	IV+/IV+ vs. IV−/IV−	Stability
	IV+/I+ vs. IV−/I−	Happiness
	IV+/II+ vs. IV−/II−	Calmness
	IV+/III+ vs. IV−/III−	Moderation
	IV+/V+ vs. IV−/V−	Toughness
	IV+/I− vs. IV−/I+	Impulse control
	IV+/II− vs. IV−/II+	Imperturbability
	IV+/III− vs. IV−/III+	Cool-headedness
	IV+/V− vs. IV−/V+	Tranquility
Factor V Intellect	V+/V+ vs. V−/V−	Intellect
	V+/I+ vs. V−/I−	Ingenuity
	V+/II+ vs. V−/II−	Reflection
	V+/III+ vs. V−/III−	Competence
	V+/IV+ vs. V−/IV−	Quickness
	V+/I− vs. V−/I+	Introspection
	V+/II− vs. V−/II+	Creativity
	V+/III− vs. V−/III+	Imagination
	V+/IV− vs. V−/IV+	Depth

3. Method

3.1. Measures

3.1.1. The 45 Abridged Big Five Circumplex questionnaire from the IPIP (IPIP-45AB5C)

This questionnaire was developed within the International Personality Item Pool project, which was created by Goldberg (1999) and Goldberg et al. (2006). The IPIP-45AB5C includes 486 items that are grouped into 45 scales (9–13 items per scale). These scales are targeted at each of the bipolar facets within the Goldberg's (1999) version of the AB5C model. Participants indicate their answers on 5-point Likert scales. We translated 486 items into Polish based on the discussions of a group of three personality psychologists who accounted for both the linguistic meanings of the items and the theoretical meaning of each scale.

The reliabilities of the scales in Polish sample measured by Cronbach's alpha coefficients were satisfactory. Only two of the scales scored below .70 (Rationality = .58 and Nurturance = .68). The scores for the remaining 43 scales ranged between .70 and .87, and the average of all scales was .79. The Cronbach's alpha coefficients for both the Polish and English versions are reported in Table 3.

3.1.2. The Revised NEO Personality Inventory (NEO-PI-R)

We used the Polish adaptation of the NEO-PI-R prepared by Siuta (2006). The NEO-PI-R contains 240 items and assesses 30 facets of the FFM (Costa & McCrae, 1992). In these analyses, we only used scores of the five basic factors. The reliabilities of these scales ranged from .86 (Agreeableness) to .91 (Neuroticism and Conscientiousness).

3.1.3. The IPIP version of Revised NEO-Personality Inventory (IPIP-NEO-PI-R)

The IPIP-NEO-PI-R (Goldberg, 1999) is an instrument that was developed within the IPIP project to measure the traits distinguished in the FFM of Costa and McCrae (1992) and measured by NEO-PI-R. Thus NEO-PI-R and IPIP-NEO-PI-R are alternative operationalization of the same theoretical model. A Polish version of IPIP-NEO-PI-R was prepared in the same way as the IPIP-45AB5C. The questionnaire includes 300 items and assesses each of the 30 facets with 10 items. In these analyses, we only used the scores of the five basic traits. The reliabilities of these scales ranged from .91 (Openness) to .95 (Neuroticism). The Cronbach's alpha coefficients for the five factors as measured with all of the applied questionnaires are shown in Table 2.

3.2. Participants

The sample consisted of 913 participants (55% women) aged between 16 and 83 years (M_{age} = 30.9, SD_{age} = 13.8). A large majority of the research group lived in cities; 28.9% of the participants lived in cities with fewer than 100,000 inhabitants, 9.3% lived in cities with 100,000–500,000 inhabitants, and 42.2% lived in cities with more than 500,000 inhabitants. The sample was dominated by inhabitants of central Poland. Students constituted 30.5% of the group. Individuals with middle levels of education composed 20.5% of the group, and individuals with higher education composed 30.1%. Single individuals formed 41.2% of the sample, 25.6% were in a relationship, and 27.5% were married.

The study was conducted using the paper-and-pencil method in four sessions with approximately 1–2 weeks distance between sessions. The main reason for this procedure was the large number of items included in personality inventories used in the study. All participants completed the IPIP-45AB5C administered in the first two sessions. Nearly the entire sample (888 respondents) completed the NEO-PI-R during the third session. In the fourth session, 364 respondents who had completed the IPIP-NEO-PI-R participated (the others completed different questionnaires not relevant to this study). Participation in the study was voluntary. Appropriately trained psychology students assisted in conducting this research; each of these students administered the test instruments to approximately 10 respondents.

4. Results

4.1. Convergent and discriminant validity of the five factors measured with the IPIP-45AB5C

The convergent and discriminant validity of the IPIP-45AB5C were verified with a multi-trait multi-method matrix (MTMM, Campbell & Fiske, 1959). The MTMM matrix for the IPIP-45AB5C, NEO-PI-R, and IPIP-NEO-PI-R is presented in Table 2. The correlation coefficients support the assumption that, on the level of the five basic traits, the IPIP-45ABC measures the same factors as the

Table 2
Multi-trait multi-method matrix for the IPIP-45AB5C, NEO-PI-R, and IPIP-NEO-PI-R.

		IPIP-45AB5C					NEO-PI-R					IPIP-NEO-PI-R				
		I EKS	II AGR	III CON	IV STA	V INT	I EKS	II AGR	III CON	IV NEU	V OPN	I EKS	II AGR	III CON	IV NEU	V OPN
IPIP-45AB5C	I EKS	.95														
	II AGR	.09	.94													
	III CON	−.04	.22	.95												
	IV STA	.07	.02	.29	.96											
	V INT	.37	.30	.17	−.00	.94										
NEO-PI-R	I EKS	**.75**	.17	−.07	.03	.35	.89									
	II AGR	−.19	**.63**	.11	.08	−.07	−.06	.86								
	III CON	.05	.20	**.75**	.25	.19	.05	.17	.91							
	IV NEU	−.32	.03	−.27	**−.76**	−.10	−.25	.02	−.33	.91						
	V OPN	.33	.33	−.09	−.15	**.69**	.50	.04	.05	.05	.89					
IPIP-NEO-PI-R	I EKS	**.77**	.10	−.22	.06	.28	**.78**	−.09	−.15	−.22	.42	.94				
	II AGR	−.11	**.73**	.22	.02	.04	−.03	**.71**	.17	.07	.09	−.10	.92			
	III CON	−.03	.27	**.75**	.26	.14	−.09	.17	**.71**	−.26	−.04	−.05	.29	.94		
	IV NEU	−.31	.01	−.21	**−.70**	−.06	−.27	.01	−.22	**.75**	.00	−.36	−.02	−.44	.95	
	V OPN	.34	.31	−.08	−.17	**.74**	.43	.01	−.03	.10	**.80**	.49	.12	.03	−.00	.91

Note: The Cronbach's alphas are indicated on the diagonal. EKS – Extraversion, AGR – Agreeableness, CON – Conscientiousness, STA – Emotional Stability, NEU – Neuroticism, INT – Intellect, OPN - Openness to experience. The correlation coefficients between corresponding scales are shown in bold.

NEO-PI-R and the IPIP-NEO-PI-R, both of which are based on the hierarchical FFM of Costa and McCrae (1992). In all cases, the correlations between the same traits as measured with different methods were the highest (i.e., these correlations were higher than the correlations between various traits measured with the same method and higher than the correlations between different traits measured with different methods). It is worth noting that the IPIP-45AB5C and IPIP-NEO-PI-R contain 184 overlapping items, and 140 items (47% of all IPIP-NEO-PI-R items) belong to corresponding scales of both measures. This could impact on the size of correlations between measures. On the other hand there are no overlapping items between the NEO-PI-R and IPIP-NEO-PI-R or between the NEO-PI-R and IPIP-45AB5C. Therefore, it seems that overlapping items do not inflate the correlation coefficients between the IPIP-45AB5C and IPIP-NEO-PI-R essentially.

The intercorrelations among the IPIP-45AB5C scales were moderate and did not exceed .4. The highest value of .36 were observed between Extraversion and Intellect. In general, the correlations between the IPIP-45AB5C scales were lower than those between the NEO-PI-R scales and between the IPIP-NEO-PI-R scales.

4.2. Structural validity of 45 traits measured by the IPIP-45AB5C

We decided to use confirmatory factor analysis because of two reasons. First, it enables us to test the strong theoretical assumption about zero cross-loadings in cases where they are theoretically predicted. Second, it enables us to test the structure at two levels simultaneously: measurement model (facets loaded by items) and a structural model (basic traits loaded by facets). Due to the large number of items in the IPIP-45AB5C questionnaire (486 items with 9–13 items for each scale), a parceling method was used. In this method, the means of groups of items were introduced as observable variables (Little, Cunningham, & Shahar, 2002; Williams & Boyle, 2008). The items that were intended to measure one facet were randomly divided into three parcels. Thus, the tested model consisted of 135 observable variables, 45 facets and five second-order factors that represented the five basic personality traits. Forty of the 45 facets loaded onto two factors, and the remaining five facets loaded onto single factors. In other words, we expected that, in the five-factor structure, each facet would exhibit a high loading on its own appropriate factor and that the 40 facets would also load onto relevant second factors. We expected that the loading on the second factor would be smaller than the loading on the first factor and that the signs of the cross-sloadings (i.e., positive or negative) would be as predicted by the model.

We evaluated the global fit of the second-order CFA models using the comparative fit index (CFI) and the root means square error of approximation (RMSEA). Due to the large sample, we did not rely on the chi^2 test. We regarded CFI values > 0.90 (Bentler, 1990) and RMSEA values < 0.06 (Browne & Cudeck, 1993) as indicators of a reasonable fit. However, according to Kenny and McCoach (2003), in complex models, CFIs tend to decline even when the model is correctly specified. Therefore, Kenny and McCoach (2003) recommend the simultaneous examination of the RMSEA and the CFI. If the CFI is lower and the RMSEA is acceptable, there is no reason to reject the model. According to Kenny and McCoach (2003), a model with a large number of variables should be rejected if both the RMSEA and the CFI are poor.

In the second-order CFA, we obtained the following fit indicators: chi^2 = 28262.7, df = 8815, CFI = 0.741, and RMSEA = 0.050 [0.049–0.050]. The fit was not perfect; however, based on the RMSEA indicator and the recommendations of Kenny and

Table 3
Standardized factor loadings in the second level of the second-order confirmatory factor analysis of the IPIP-45AB5C.

Scale/facets		Factors					Cronbach's alpha	
		I	II	III	IV	V	Polish version	Original version
I+/I+	Gregariousness	.88					.86	.83
I+/II+	Friendliness	.69	.45				.82	.85
I+/III+	Assertiveness	.72		.50			.76	.75
I+/IV+	Poise	.80			.39		.79	.82
I+/V+	Leadership	.77				.17	.79	.82
I+/II−	Provocativeness	.85	−.42				.71	.72
I+/III−	Self-Disclosure	.79		−.24			.82	.78
I+/IV−	Talkativeness	.78			−.46		.86	.84
I+/V−	Sociability	.88				−.50	.72	.66
II+/II+	Understanding		.76				.84	.81
II+/I+	Warmth	.49	.74				.85	.84
II+/III+	Morality		.79	.21			.83	.73
II+/IV+	Pleasantness		.78		.42		.70	.76
II+/V+	Empathy		.55			.56	.70	.70
II+/I−	Cooperation	−.59	.65				.79	.73
II+/III−	Sympathy		.90	−.19			.81	.74
II+/IV−	Tenderness		.73		−.45		.72	.74
II+/V−	Nurturance		.92			−.36	.68	.71
III+/III+	Conscientiousness			.89			.83	.75
III+/I+	Efficiency	.02		.91			.87	.83
III+/II+	Dutifulness		.47	.61			.81	.78
III+/IV+	Purposefulness			.86	.14		.83	.81
III+/V+	Organization			.68		.43	.82	.78
III+/I−	Cautiousness	−.55		.67			.79	.77
III+/II−	Rationality		−.50	.76			.58	.67
III+/IV−	Perfectionism			.74	−.36		.78	.76
III+/V−	Orderliness			.73		−.15	.79	.78
IV+/IV+	Stability				.91		.83	.86
IV+/I+	Happiness	.48			.75		.86	.84
IV+/II+	Calmness		.25		.88		.84	.83
IV+/III+	Moderation			.54	.56		.74	.76
IV+/V+	Toughness				.85	.12	.86	.84
IV+/I−	Impulse Control	−.55			.69		.84	.78
IV+/II−	Imperturbability		−.31		.82		.84	.84
IV+/III−	Cool−Headedness			−.51	.56		.70	.73
IV+/V−	Tranquility				.73	−.34	.80	.76
V+/V+	Intellect					.96	.74	.81
V+/I+	Ingenuity	.38				.55	.84	.84
V+/II+	Reflection		.32			.62	.81	.75
V+/III+	Competence			.39		.66	.71	.74
V+/IV+	Quickness				.26	.73	.81	.84
V+/I−	Introspection	−.52				.67	.78	.71
V+/II−	Creativity		−.26			.95	.76	.81
V+/III−	Imagination			−.25		.83	.80	.78
V+/IV−	Depth				−.40	.67	.79	.87

McCoach (2003), we considered the model to be acceptable. Table 3 lists the factor loadings that were obtained only at the second level of the CFA; i.e., the 45 facets for 5 factors. The factor loadings of the 135 parcels for the 45 facets are omitted. The full results of the second-order CFA are available from the authors upon request.

The general results of the factor structure analysis confirm the assumptions of the AB5C model. First, the signs of all of the loadings were in the correct direction. Second, all but one facet (Empathy) loaded highest on its own factor. Third, a large majority of the facets satisfactorily fulfilled the model's restrictive demands regarding the size of the second factor loadings. Only six of the scales exhibited poor (<.2) second factor loading coefficients (Efficiency, Leadership, Sympathy, Purposefulness, Orderliness and Toughness); the remaining six scales exhibited relatively low (<.3) second loadings (Self-Disclosure, Morality, Calmness, Quickness, Creativity and Imagination). Additional slightly less serious problems were detected in the cases of Cool-Headedness, Moderation, and Empathy, which exhibited nearly equal first and second loadings. Furthermore, with regard to Understanding, a higher factor loading on Agreeableness could reasonably be expected, because Understanding is a core aspect of Agreeableness.

5. Discussion

In the present study, we examined the structure of personality traits as measured by the Polish version of the IPIP-45AB5C inventory. The circular model of the structure of personality traits presents a serious alternative to the hierarchical model. In this study, nearly all of the investigated facets exhibited high loadings on the appropriate factors, and the majority of the facets exhibited the expected secondary factor loadings. In contrast, the majority of the facets in hierarchical models typically exhibit secondary loadings above .25, which are not assumed by the theory (Barbaranelli & Caprara, 2002; DeYoung et al., 2007; McCrae & Costa, 2003; McCrae et al., 1996; see Backström et al., 2009).

However, our results revealed certain deviations from the theoretical trait structure that is assumed by the AB5C model; i.e., some of the secondary factor loadings seemed to be too low. These deviations can be attributed to the properties of the IPIP-45AB5C questionnaire (including its Polish adaptation) or to the features of Goldberg's version of AB5C model. As Backström et al. (2009) concluded the IPIP-45AB5C inventory is not in its final stage of development and requires some refinement. Nevertheless, this

inventory still proves that the successful building of a questionnaire to measure the AB5C model is possible. Furthermore, previous research may serve as a foundation for the construction of a refined tool for measuring the personality traits in the AB5C model that is based on the IPIP-AB5C.

Moreover some of the above-mentioned problems are likely related to the conceptualization of certain facets in Goldberg's version of the AB5C model. Based on our results and Swedish (Backström et al., 2009) results, we suspect that Goldberg's definitions of some of the facets, such as Efficiency, Sympathy, Orderliness, Creativity and Toughness, are problematic and raise doubts. Thus, in further research, re-conceptualizations of certain facets of Goldberg's version of the AB5C model are needed.

However, our results generally support the basic theoretical assumptions of the AB5C model and indicate that the circumplex model may serve as an alternative to the hierarchical model as a concept for organizing lower-level traits (Backström et al., 2009).

Hofstee et al. (1992) metaphorically suggested that AB5C circumplexes could be treated as a type of 'periodic table' of traits. In relation to this statement AB5C model offer the possibility of integrating numerous, more detailed conceptions of personality and temperament into a single model of basic dimensions of personality because every circumplex in the AB5C comprises a different sphere or domain of personality. Some of these domains have previously been conceptualized by other theories. For example, the interpersonal traits conceptualized by Wiggins (1980, 1995) are described by the circumplex of factors I and II; Eysenck's (Eysenck & Eysenck, 1985) circle of personality, Gray (1987) theory of temperament (Behavioral Inhibition System and Behavioral Activation System, BIS/BAS), and Russell (1980) model of affect could be considered to be based on the circumplex of factors I and IV; the dispositional dimensions of self-regulation can be described by the circumplex of factors III and IV; and the dimensions of moral functioning can be described by the circumplex of factors II and III. The AB5C model also includes circles describing psychological content that has not yet been conceptualized by any personality theory or conception and may represent interesting areas for new research on personality.

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