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Number and content of personality types across methods and samples: Empirically filling the theoretically developed map of RUNO typology

Abstract: Personality types are currently understood as basic configurations of personality traits from the Big Five model. However, to date, research has provided inconsistent results as to the number and content of personality types. The broadest support was found for the three-type RUO (Resilient-Undercontrolled-Overcontrolled) typology, but many studies indicate the existence of four or five basic personality types. The prevalence of an exploratory orientation in research on personality types was identified as the main cause of these inconsistencies, and the need for a well-justified theoretical basis for the personality typology was observed. The current study examines the predictions resulting from the four-type RUNO (Resilient-Undercontrolled-Nonresilient-Overcontrolled) typology – a proposal built on the Two Factor Model of personality and its extension: the Circumplex of Personality Metatraits. We used various measurement instruments (11 questionnaires to measure Big Five traits), samples (five samples with a total of 4430 respondents) and statistical procedures (cluster analyses on row and standardized data) testing the three-type, four-type and five-type solutions. We expected that although the robustness of the empirically derived type-solutions across different research conditions will be limited (in accordance with the previous studies), the configurations of each type found in the Big Five data will be in a concordance with the RUNO typology. Obtained results roughly confirmed our expectations. We conclude that a renewed focus on the theoretical basis of personality typology seems to be necessary to further advance this field of research and the Circumplex of Personality Metatraits enables the essential turn from an exploratory approach (usually used in the previous studies) to a theoretically driven approach (proposed by us in the current study) to personality typology.

Key words: *Big Five, RUO personality types, RUNO typology, Two Factor Model, Circumplex of Personality Metatraits*

INTRODUCTION

The Big Five, also known as the Five Factor Model (FFM), is the predominant model of personality trait structure. It assumes that all personality traits are organized within five basic domains: Neuroticism (N) vs. Emotional Stability, Extraversion (E), Openness to experience (or Intellect; O), Agreeableness (A), and Conscientiousness (C). The FFM is rooted in two research traditions (De Raad & Perugini, 2002; John & Srivastava, 1999): it was discovered and preliminarily verified by psycholexical studies as the Big Five model (Goldberg, 1990), and then expanded theoretically and empirically within the questionnaire research (McCrae & Costa, 2003). Although the five factors are conceptualized slightly differently in these traditions (Saucier & Goldberg, 1996) and there are many instruments for measuring the five factors, many studies have demonstrated considerable overlap and consistency between the various five-factor frameworks, which allows all of them to be considered as concerning the same FFM model (De Raad & Perugini, 2002; Goldberg, 1990; John & Srivastava, 1999; McCrae & John, 1992; Trapnell & Wiggins, 1990).

However, although the FFM has gained wide empirical support, it has also been met with extensive criticism. One of the main criticisms has been about the same concept of a trait (Block, 1995, 2010; McAdams, 1992) and this criticism has led to (among others) the return of research on personality types, which are currently usually understood as configurations of the trait dimensions of personality (Strelau, 2002). These studies, conducted over the last 20 years, did not bring a unambig-

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uous results. On the one hand, the broadest support was found for the three-type RUO (Resilient-Undercontrolled-Overcontrolled) typology (Donnellan & Robins, 2010), with the *Resilient* type usually consisting of low Neuroticism (N-), high Conscientiousness (C+), and elevated Extraversion (E+); the *Undercontrolled* type comprising low Conscientiousness (C-) and decreased Agreeableness (A-); and *Overcontrolled* type consisting of high Neuroticism (N+) and low Extraversion (E-). On the other hand, the RUO typology cannot be treated as the final solution since many studies indicate the existence of four (e.g., Gramzow et al., 2004; Gerlach, Farb, Revelle, & Amaral, 2018) or five basic personality types (e.g., Grumm & von Collani, 2009; Herzberg & Roth, 2006). The main problem of the contemporary research on personality types conducted to date is that most of them (1) were rather exploratory, and at the same time (2) they rarely tested the replicability of the found solution across measurement methods, analytical strategies, and larger number of samples. The aim of our study is to overcome both these limitations.

First, through building on the Two Factor Model of personality (TFM; Cieciuch & Strus, 2017) and its extension – the Circumplex of Personality Metatraits (CPM; Strus & Cieciuch, 2017, 2019; Strus, Cieciuch, & Rowiński, 2014a) rather than the FFM, we are able to predict the personality types as sets of most likely configurations of the five basic traits. The FFM framework assumes that all five traits are orthogonal in population, so in principle the probability to find a subgroup with every possible configuration of these traits is virtually the same. For example, a configuration with E+ and O+ (high Extraversion and high Openness) is expected as much as a configuration with E+ and O- (high Extraversion and low Openness). In the framework of higher-order factors of personality, things look totally different. After identifying the metatraits above the Big Five, some configurations are possible and some configurations simply cannot be expected. According to the TFM (Cieciuch & Strus, 2017), built upon the results obtained by Digman (1997) and DeYoung (2006; DeYoung, Peterson, & Higgins, 2002), the most basic and indeed orthogonal dimensions of personality are *Alpha/Stability* and *Beta/Plasticity*. Alpha is composed of the shared variance of Neuroticism (with opposite pole), Conscientiousness and Agreeableness while Beta is composed of the shared variance of Extraversion and Openness to experience. Thus, what can be expected in terms of personality types, understood as most often meet configurations of traits, are four possible configurations of Alpha and Beta (see Figure 1). To continue the example provided above, configuration with E+ and O+ are expected, in contrast to configurations with E+ and O-.

On this basis, Strus et al., (2021) propose a four-type RUNO (Resilient-Undercontrolled-Nonresilient-Overcontrolled) typology that identifies the four possible types from the theoretical point of view, i.e., on the basis of the specific predictions derived from the theoretical model (TFM and CPM; see Figure 1). The RUNO typology consists of a *Resilient* type with a N-, E+, O+, A+, C+ configuration of traits, an *Undercontrolled* type with a configuration of N+, E+, O+, A-, C-, a *Nonresilient*

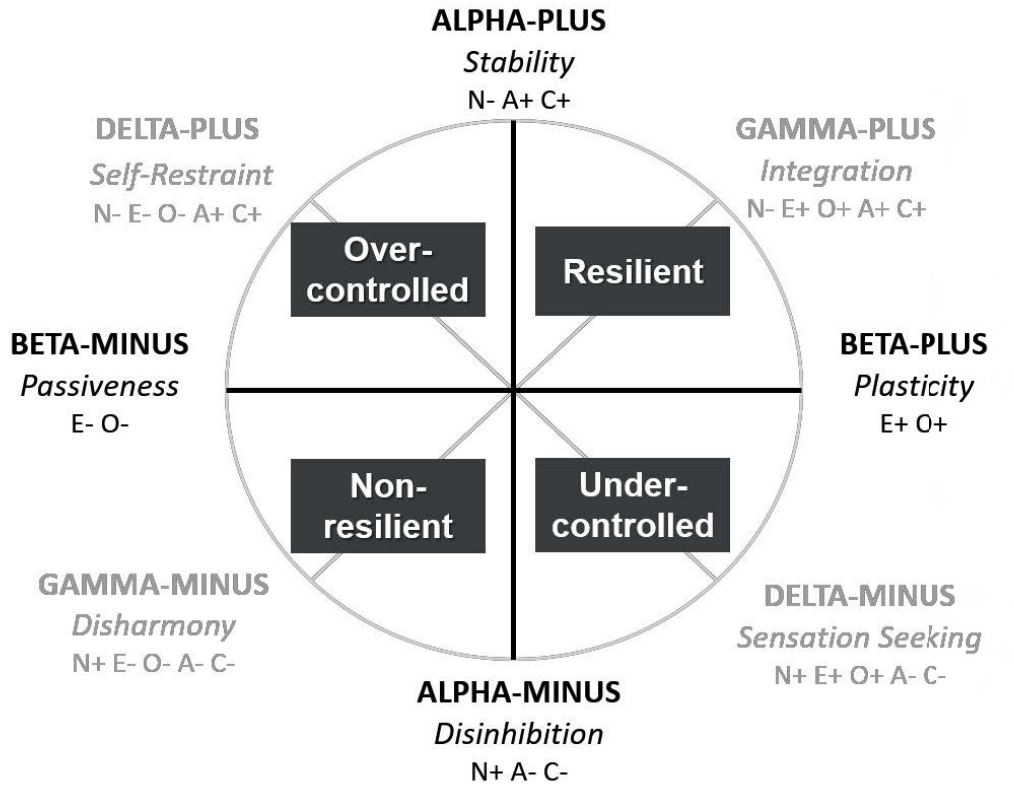

Figure 1. The RUNO personality typology based on the Two Factor Model of personality and Circumplex of Personality Metatraits.

type with configurations of N+, E-, O-, A-, C-, and an *Overcontrolled* with a N-, E-, O-, A+, C+ configuration. The RUNO typology is theoretical driven from the TFM and the distinguished types cover the whole spectrum of meaningful trait configurations, including types distinguished in RUO typology. Indeed, the RUNO supplements and partly modifies the RUO typology (especially with regard to the Overcontrolled type which is relabeled as Nonresilient; see Strus et al., 2021). Moreover, it is the CPM model which gives the RUNO types a specific psychological content, as the former includes metatraits that precisely correspond to the latter (see Figure 1). These exact CPM counterparts of RUNO types are poles of *Gamma/Integration* and *Delta/Self-Restraint* (see Zawadzki, 2016, 2017) of which CPM model complements Alpha and Beta creating the circumplex space (Strus & Cieciuch, 2017, 2019; Strus et al., 2014a). The RUNO typology with the configurations of FFM traits is presented on Figure 2.

To overcome the second limitation of research thus far, we systematically tested for the robustness of the findings across various measures, samples and analytical techniques. Therefore, we used a wide range of 11 FFM/Big Five measures administered in five different samples. The data were analyzed with regards to a few aspects: (a) analyzing types across various measures within the same sample and (b) comparing types within the same measure across different samples. Furthermore, we (c) provided analyses on both the raw and the standardized data.

Based on previous studies, we predicted limited stability of the empirically derived type-solutions across different measures, samples, and statistical procedures – a three-type (RUO or RUN) solution was expected to emerge as the most robust, although in many cases the four-type or five-type solutions will occur as better replicable. However, our main hypothesis is that, irrespective of all included research conditions as well as obtained solution, the configurations of each type found in the FFM data will be in a concordance with the expectations depicted in Figure 2. The empirically found personality types do not have to reveal all predicted features but we expect that they will not reveal any features contradictory to predictions formulated in Figure 2. For example, the Undercontrolled type is allowed to not reveal high Extraversion but it is not allowed to reveal low Extraversion (see Figure 2).

METHOD

Eleven Big Five measures

NEO Personality Inventory – Revised (NEO-PI-R; Costa & McCrae, 1992; Polish adaptation: Siuta, 2006) and the ***NEO Five Factor Inventory*** (NEO-FFI; Costa & McCrae, 1992; adaptation: Zawadzki, Strelau, Szczepaniak, & Śliwińska, 1998) measure the FFM, however, the NEO-PI-R comprises 240 items assessing the FFM basic personality traits and their 30 facets, while NEO-FFI is a shortened, 60-item instrument measuring only the five basic traits. Responses are given on a 5-point Likert scale. In case of the NEO-PI-R only basic dimensions scores were used for the purpose of this study. The average internal consistency (i.e., Cronbach's alpha) coefficients for the NEO-PI-R in studies A and B4 ranged from .85 (A scale) to .90 (N scale), while the internal consistency of the NEO-FFI scales (study 4) ranged from .67 (O scale) to .88 (N scale).

IPIP NEO Personality Inventory (IPIP-NEO-PI-R; Goldberg, 1999; adaptation: Rowiński, Cieloch, Cybis, Strus, & Cieciuch, 2014) is an International Personality Item Pool (IPIP) version of NEO-PI-R designed to measure the FFM basic traits and their 30 facets according Costa and McCrae's (1992) model. The IPIP-NEO-PI-R consists of 300 items with a 5-point Likert response scale. For the purpose of this study only basic dimensions scores were used. Cronbach's alpha coefficients in study 2.3 ranged from .89 (O scale) to .95 (N scale).

Big Five Inventory (BFI; John & Srivastava, 1999; adaptation: Strus & Cieciuch, 2019) and the ***Big Five Inventory – Short*** (BFI-S; Gerlitz & Schupp, 2005; adaptation: Strus & Cieciuch, 2021) are questionnaires for measuring the Big Five personality factors. The

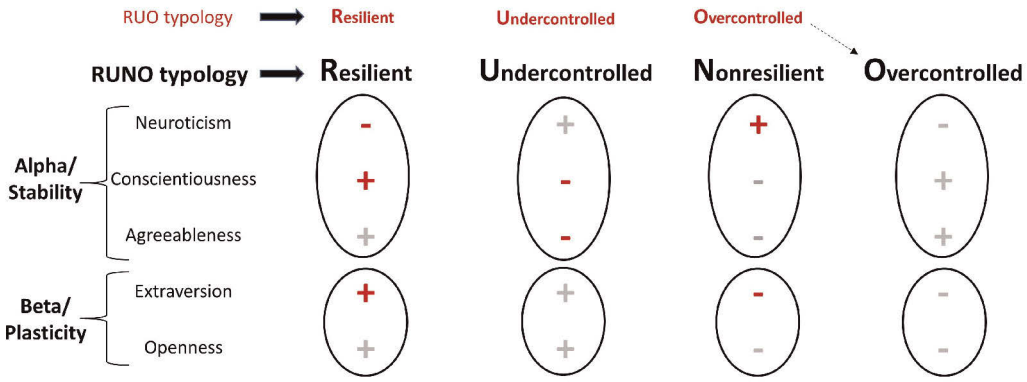

Figure 2. RUNO typology theoretically based on the Two Factor Model with Alpha and Beta. Plus means high intensity of a given trait while minus indicates low intensity. In red are the most often empirically found trait constellations of RUO typology

original 44-item version of the instrument (BFI), as well as the shortened 15-item version (BFI-S) were used in the current research. The BFI in study E had internal consistencies ranging from .74 (A scale) to .82 (N and C scales), while the average internal consistencies of the BFI-S in studies 1 and 3.1 ranged from .54 (A scale) to .68 (C scale).

Five Factor Personality Inventory (FFPI; Hendriks, Hofstee, & De Raad, 1999; adaptation was prepared by the authors of this paper) is a questionnaire measuring the Big Five basic dimensions originating from the psycholexical studies. It consists of 100 brief items with a 5-point Likert response scale. The Cronbach's alpha of the FFPI scales in the study 2.1 ranged from .85 (O and A scales) to .90 (E and N scales).

Big Five Questionnaire – 2 (BFQ-2; Caprara, Barbaranelli, Borgogni, & Vecchione, 2007; adaptation: Cieciuch, Strus, Rowiński, & Vecchione, 2012) is a revised version of a popular BFQ (Caprara et al., 1993), comprised of 134 items with 5-point Likert response scale. It was designed to assess five traits and their 10 facets, with two additional lie scales. For the purpose of this study only the Big Five scales were used, with an average Cronbach's alpha in studies 2.1 and 3.2 ranging from .85 (E scale) to .91 (N scale).

***IPIP* scales for measuring *Abridged Big Five-Dimensional Circumplex* model** (IPIP-AB5C; Goldberg, 1999, adaptation: Strus, Cieciuch, & Rowiński, 2014b) is a 485-item questionnaire derived from the IPIP, with a 5-point Likert scale measuring the Big Five dimensions (with a psycholexical origin) and their 45 facets in accordance with the AB5C model developed by Hofstee, De Raad and Goldberg (1992) and reconceptualized by Goldberg (1999; Strus et al., 2014b). For the purpose of this study, only the Big Five dimension scores were used. The internal consistency coefficients for these scales in study 1 ranged from .94 to .95.

Big Five Aspects Scales (BFAS; DeYoung, Quilty, & Peterson, 2007; adaptation: Strus, Cieciuch, & Rowiński, 2012) is a questionnaire measuring the Big Five dimensions together with their 10 intermediate-level aspects. It consists of 100 items derived from the IPIP with a 5-point Likert scale. For the purpose of this study only the Big Five scales were used, and their average Cronbach's alphas in studies 3.1 and 5 ranged from .83 (O scale) to .90 (N scale).

50-items IPIP Big Five Markers (IPIP-BFM; Goldberg, 1999; adaptation: Strus, Cieciuch, & Rowiński, 2014c) is a 50-item questionnaire with a 5-point Likert scale developed to measure the Big Five factors from a psycholexical research tradition. Each scale consists of 10 items selected to be equivalent to the adjective markers of the Big Five developed by Goldberg (1992). The average internal consistency of this measure in studies 2.5 and 4 ranged from .79 (O scale) to .90 (N scale).

Ten Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003; adaptation: prepared by the present authors) is an instrument developed to facilitate the measurement of five personality factors when multi-item instruments cannot be used for various reasons. The TIPI uses 10 brief, adjective-based items with a 7-point Likert scale. The internal consistencies of the TIPI scales in study 2.2 ranged from .50 (O scale) to .65 (C scale).

Participants and procedure

Data were collected in five studies. Each study was a part of a larger research project, concerning various aspects of personality. Participants were recruited with the help of trained psychology students. Each student recruited a group of six to ten people with roughly equal numbers of males and females. Participation in the study was voluntary, anonymous and preceded by respondents informed consent. Each study involved different measures of personality, administered across several research sessions. Due to participant dropout and missing data, the number of observations varied for each measure. In order to maximize the number of analyzed observations we decided to extract 10 samples from our datasets. The first study (study 1) included a sample of 847 participants, aged 16-83. Study 2 was a part of a project with six overlapping subsamples (study 2.1 – 2.5) with Ns ranging from 677 to 1373, and ages ranging from 16 to 79. Two subsamples were derived from Study 3 (study 3.1 and 3.2): consisting of 574 and 815 participants ranging in age from 16 to 72. Sample resulting from the fourth study (study 4) consisted of 786 participants aged 16-81. The last analyzed sample was derived from the fifth study (study 5), including 609 participants ages 16 to 81. The initial sample sizes given are prior to outlier removal (a procedure typical for this analysis; see description below), which was performed before the analysis of the data. Table 1 presents detailed sample descriptions for each sample after the outlier removal procedure.

To assess the FFM/Big Five factors of personality, a wide range of 11 well-known measures, originating in both the psycholexical and questionnaire research traditions, were used. Five measures (NEO-PI-R, BFI-S, BFQ-2, IPIP-BFM and BFAS) were used in two samples, and in five samples more than one measure were used. Table 1 details which measures were used in each study/ sample.

Analyses

Analytic methods used in research on personality types. Selecting between methods of statistical analysis when examining personality types has a crucial impact on the obtained results (see Costa, Herbst, McCrae, Samuels, & Ozer, 2002; Donnellan & Robins, 2010). After the employment of an inverse factor analysis (which is based on the intercorrelation between people rather than variables) in the classic studies on personality types (Block, 1971; Robins et al., 1996; see McCrae, Terracciano, Costa, & Ozer, 2006), currently the most often used is Ward's hierarchical cluster analysis following a *k*-means cross-validation (WHCA; Asendorpf, Borkenau, Ostendorf, & Van Aken, 2001). Although latent profile analysis (LPA; or latent class analysis – LCA) is increasingly used (Leikas & Salmela-Aro, 2014; Merz

Table 1. Sample characteristics and measures used in five studies on personality traits.

Study/Sample	Measure	N	% females	Age
1	NEO-PI-R	838	54.9	16-83, *M* = 31.01, *SD* = 13.79
	BFI-S	845	54.9	16-83, *M* = 31.00, *SD* = 13.78
	IPIP-AB5C	839	55.1	16-83, *M* = 30.98, *SD* = 13.74
2.1	FFPI	1354	55.2	16-79, *M* = 32.22, *SD* = 11.94
	BFQ-2	1357	55.4	16-79, *M* = 32.10, *SD* = 11.87
2.2	TIPI	672	51.6	17-74, *M* = 31.01, *SD* = 11.39
2.3	IPIP-NEO-PI-R	973	56.2	16-79, *M* = 33.00, *SD* = 12.20
2.4	NEO-PI-R	725	51.8	16-74, *M* = 31.04, *SD* = 11.33
2.5	IPIP-BFM	689	51.8	16-74, *M* = 31.13, *SD* = 11.41
3.1	BFAS	807	56.1	16-72, *M* = 29.74, *SD* = 12.61
	BFI-S	813	56.2	16-72, *M* = 29.72, *SD* = 12.59
3.2	BFQ-2	566	54.4	16-72, *M* = 29.54, *SD* = 12.76
4	NEO-FFI	783	57.0	16-81, *M* = 29.65, *SD* = 12.36
	IPIP-BFM	777	56.8	16-81, *M* = 29.66, *SD* = 12.36
5	BFAS	606	55.8	16-81, *M* = 31.89, *SD* = 14.18
	BFI	607	55.7	16-81, *M* = 31.87, *SD* = 14.17

Note. Sample characteristics after outlier removal.

& Roesch, 2011; Specht, Luhmann, & Geiser, 2014) in newer studies on personality types, the WHCA still seems to be the predominant method. In order to obtain results comparable to the majority of studies to date in the literature and to be able to verify their results, we used the WHCA procedure as well. However, there were still questions regarding whether raw or standardized data should be used. Usually the WHCA clustering procedure is applied on raw data, but as the interpretation of raw prototypes would be difficult, comparisons are usually made on standardized scores. This solution is entirely understandable, however, given that each transformation of data changes the distances among observations, characteristics of the standardized clusters may not be identical to their raw counterparts. Another problem appears during cross-validation, when the raw initial cluster centers from two (or more) samples need to be compared. From that perspective, performing a cluster analysis on standardized data seems to be a more consistent procedure from beginning (analysis) to end (presentation and comparison of clusters). Additionally, although data standardization can affect the results, raw score usage might cause artifacts in type identification (e. g., by differently weighting the variables in regards to their standard deviation, or by allowing gender differences in trait levels to affect cluster membership; Costa et al., 2002), thereby increasing the possibility of replicating a three-cluster solution (Asendorpf et al., 2001; Costa et al., 2002). On the other hand, each data transformation – including standardization – changes the results to some extent and non-transformed, raw data should yield results that represent the actual relationships among observations more accurately. Due to these among other reasons, most studies on personality prototypes still analyze raw scores.

Analytic methods used in the current study. Taking into account the above explanations, we decided to primarily use raw data (with standardization only for- and just before the presentation and comparison of type profiles). However, we also conducted the analysis on standardized data in order to compare the results to those from the raw data and examine the average replicability of type solutions (Cohen's κ) in different forms of data.

In the first step, we identified multivariate outliers using Mahalanobis distance separately for each measure and excluded them from the analysis, as outlying observations tend to influence the clusters obtained. The percentage of excluded observations across all measures and samples ranged from 0.24 to 1.39. Next, we applied the clustering procedure proposed by Asendorpf et al., (2001), combining Ward's hierarchical cluster analysis and the nonhierarchical *k*-means procedure with cross-validation. We conducted this procedure on each sample, separately for the standardized and raw data from each questionnaire. First, samples were randomly divided in halves, and Ward's hierarchical cluster analysis (with squared Euclidean distance as proximity measure) was carried out on the mean factor scores in both halves. The cluster centers obtained in this step were then used in the *k*-means analysis. We used the final cluster centers (from the *k*-means analysis) for cross-validation: participants of a given half of the sample were classified on the basis of their distance to the cluster centers of the other half of the sample. This procedure was repeated for three, four, and five solutions. Classifications were then compared for agreement with Cohen's κ. The average κ of a particular cluster solution in two halves was the indicator of its replicability. Values of at least .60 suggest acceptable replicability (see Asendorpf et al., 2001, also for more

detailed description of this procedure). In total, we carried out 32 analyses – 16 on raw data and 16 on standardized data as we had a total of 16 subsamples in our research.

RESULTS AND DISCUSSION

Replicability of types

Table 2 shows the replicability indices (the average Cohen's κ) of the cluster solutions from the raw and standardized data. In the raw data, a three-cluster solution was the most replicable in eight out of 16 analyzes. However, its superiority over the four-cluster solution was not evident, because as many as six analyses pointed to the latter solution. The five-cluster solution was the most replicable only in two cases. Moreover, in several analyses more than one solution showed sufficient replicability (Cohen's $\kappa \geq .60$). Taking that into account, the three-cluster solution could be chosen in 11 cases, the four-cluster solution in eight and the five-cluster solution in four cases. In three cases, the Cohen's κ value did not meet the .60 cut-off point and can be interpreted as moderate: $\kappa = .54$ for the five-cluster solution in IPIP-NEO-PI-R (sample 2.3); $\kappa = .49$ for the four-cluster solution in NEO-PI-R (sample 2.4), and $\kappa = .45$ for the three-cluster solution in BFI-S (sample 3.1). These were, however, the most replicable solutions for mentioned measures/samples.

In contrast, the predominance of the three-cluster solution was evident in the standardized data, where it was most replicable in 10 analyses, compared to three such cases for four- and three cases for the five-cluster solution. For the three-cluster solutions, the Cohen's κ value met the .60 cut-off point 10 times, with four times for both four- and five-cluster solutions. The average replicability of all tested solutions, when raw and standardized data were compared, was very close (average Cohen's $\kappa = .58$ and .56, respectively).

Our research goals include verifying the stability or robustness of type solutions across different statistical procedures, as well as different samples and measures. The comparison of the total of 16 pairs of results obtained for raw and for standardized data allowed us to examine the robustness of the obtained results in regards to the statistical procedure of data standardization. This comparison led to the conclusion that in 10 cases the results were similar and in six cases they were different.

Next, we examined the robustness of the cluster solutions across different samples using the same measures and both forms of data. In the raw data, only two of the five measures – the BFQ-2 (four-cluster solution) and the BFAS (three-cluster solution) obtained results that were stable across samples. The other three measures (NEO-PI-R, IPIP-BFM, BFI-S) used twice in two different samples, revealed different solutions in each sample. In turn, the standardized data produced slightly different results, namely in three of the five measures results were robust and in other two they led to a different conclusion. Stable results were obtained for the BFAS (three-cluster solution), the NEO-PI-R (four-cluster solution) and the BFI-S (three-cluster solution) questionnaires, while inconsistent results were obtained for the BFQ-2 and the IPIP-BFM across the two different samples. Overall, only the BFAS resulted in the same three-cluster solution regardless of the sample and data standardization.

Finally, to examine the robustness of the cluster solutions across measurement instruments, we compared five sets of solutions that were obtained with various FFM measures used in the same samples. In analyses on the raw data, three cases led to a stable results across different measures: a four-cluster solution for the NEO-FFI and the IPIP-BFM in sample 4, a three-cluster solution for the BFAS and the BFI-S in sample 3.1, and a three-cluster solution for the BFAS and BFI in sample 5. Measures used in samples 1 and 2.1 varied among each another in terms of the best cluster solution. Similarly, in the analyses on the standardized data, stable results were found in three cases. Namely, a three-cluster solution was found for the FFPI and the BFQ-2 in sample 2.1, for the BFAS and the BFI-S in sample 3.1, and for the BFAS and the BFI in sample 5. The best solutions for the measures used in samples 1 and 4 were different for different measures. Moreover, it is worthwhile to note that the analyses in sample 2.1 and sample 4 led to different conclusion regarding measure robustness, depending on the kind of data (raw or standardized) that was used. The analyses robustly indicated the same three-cluster solution regardless of the measure (BFAS and BFI/BFI-S in both) and data standardization in only two cases – sample 3.1 and sample 5.

Summing up, the results show a rather limited robustness of the cluster solutions across different statistical procedures, samples, and measures.

Description of personality types

Subsequently, we analyzed personality types obtained from the best replicable solution in each measure used. As mentioned above, we decided to analyse the three-, four- or five-cluster solutions obtained from the raw data (see Table 2), with standardization just before the presentation (and comparison) of type profiles. To facilitate the comparison of personality profiles, we reversed coded Emotional stability scores in some of the measures so that all types are described with Neuroticism. Although, there are few criteria used in the literature to determine the cut-offs for average, and high/low levels of analyzed traits (often not explicitly or precisely established), we have adopted the following nuanced and subtle thresholds. Standardized Z values in the range of -.25 to .25 indicate an average level of a personality trait; Z values in the range of -.50 to -.26 and .26 to .50 indicate below or above average levels of a trait, respectively; while Z values below -.50 and over .50 indicate low or high levels of a trait, respectively.

Three-cluster solution. The three-cluster solution showed the best replicability in sample 1's NEO-PI-R, the FFPI (sample 2.1), the TIPI (sample 2.2), sample 2.5's IPIP-BFM, both measures used in sample 3.1 (BFAS and BFI-S), and both measures used in sample 5 (BFAS and BFI; see Table 2). However, in these solutions it was possible to identify not only three RUO/RUN types (five

Table 2. Replicability of the three, four, and five cluster solutions

Sample	Measure	Average Cohen's κ raw data			Average Cohen's κ standardized data		
		3 clusters	4 clusters	5 clusters	3 clusters	4 clusters	5 clusters
1	NEO-PI-R	**.85**	.61	.43	.61	**.83**	.74
	BFI-S	.77	.56	**.78**	**.71**	.55	.43
	IPIP-AB5C	.50	**.60**	.56	.35	.47	**.70**
2.1	FFPI	**.73**	.54	.45	**.88**	.77	.81
	BFQ-2	.79	**.82**	.59	**.80**	.71	.67
2.2	TIPI	**.90**	.71	.69	**.84**	.57	.56
2.3	IPIP-NEO-PI-R	.23	.46	**.55**	.10	.39	**.51**
2.4	NEO-PI-R	.26	**.50**	.36	.28	**.40**	.37
2.5	IPIP-BFM	**.74**	.69	.65	**.59**	.44	.34
3.1	BFAS	**.88**	.26	.36	**.76**	.48	.56
	BFI-S	**.45**	.25	.32	**.91**	.58	.59
3.2	BFQ-2	.74	**.79**	.35	.52	**.79**	.59
4	NEO-FFI	.65	**.85**	.60	**.72**	.19	.53
	IPIP-BFM	.43	**.68**	.49	.25	.18	**.58**
5	BFAS	**.91**	.40	.50	**.76**	.55	.54
	BFI	**.60**	.50	.58	**.71**	.44	.36
Number of κ ≥ .60		11	8	4	10	4	4
Number of the highest mean κ		8	6	2	10	3	3

Note: Highest mean kappas are in bold.

of eight cases), but also a fourth type included in RUNO typology, namely the Overcontrolled type (three of eight cases). Therefore, within the three-cluster solutions we found the Resilient, Undercontrolled, Nonresilient, and sometimes Overcontrolled type instead of Undercontrolled (FFPI and IPIP-BFM from sample 2.5) or Nonresilient (TIPI), albeit with some anomalies (i.e., unexpected elements) in a few profiles. Nevertheless, these unexpected trait-elements in the obtained profiles—contradictory to the main hypothesis—were only six of 97 cases (i.e., 6%).

The Resilient type, characterized by almost full expected configuration of low N and high scores on the remaining Big Five dimensions, appeared in all mentioned measures and samples (see Table 3 and Figure 3). In only two cases some of the scores were close to average – this applied to A in sample 1's NEO-PI-R as well as to C and A in samples 2.1's FFPI.

The Nonresilient type was nearly as common as the Resilient type (i.e., obtained seven times; see Table 3 and Figure 4). It was usually characterized by high or above average Neuroticism and low or below average scores on the remaining traits, although only in the FFPI it completely matched this expected configuration. On the other hand, the only serious inconsistency with the expected pattern was a below average level of N in the BFAS profile obtained in sample 5.

The Undercontrolled type was also obtained in most of the three-cluster solutions (i.e., six of the eight cases; see Table 3 and Figure 5). In most cases this type was characterized by high or above average N, E and O, as well as low or below average C and (though only in half cases) A, as expected. However, this profile was clear and evident in three cases, i.e., in the TIPI, the BFI and the BFI-S, and in two BFAS cases considerable anomalies were observed. Undercontrollers in the three-cluster solutions identified using the BFAS (samples 3.1 and 5) displayed below average E, and elevated A, contrary to the expectations for this prototype. However, this seems to be an artifact related to the BFAS instrument, as it occurred only in this measure.

A personality type similar to the Overcontrolled prototype was found in three of the three-cluster solutions: in the FFPI (sample 2.1), the TIPI (sample 2.2) and the IPIP-BFM (sample 2.5) profiles. However, its characteristics were rather moderately marked (especially in the case of the FFPI), and not without anomalies (IPIP-BFM; see Table 3 and Figure 6). We expected low N, E and O, as well as high A and C for the Overcontrolled type. Meanwhile, Overcontrollers in the three-cluster solutions had the expected low E and low O in the TIPI, above average C in the FFPI, as well as low E, low O and below average N in the IPIP-BFM. Therefore, the broadest configuration of the Overcontrolled type in the three-cluster solutions was obtained for the IPIP-BFM

Table 3. Personality profiles obtained in the best replicated three-cluster solutions

Sample	Measure	Type	N	Big Five scores	Age	
					M	SD
1	NEO-PI-R	Resilient	260	N–, E++, O+, C++	31.34_{U}	13.46
		Undercontrolled	217	N++, E+, O++, C–	$25.35_{N,\ R}$	9.20
		Nonresilient	361	E–, O–, C-	34.17_{U}	15.23
2.1	FFPI	Resilient	439	N–, E++, O++	$29.70_{N,\ O}$	10.53
		Nonresilient	360	N++, E–, O–, A–, C–	31.99_{R}	11.60
		Overcontrolled	555	C+	34.36_{R}	12.81
2.2	TIPI	Resilient	288	N–, E++, O+, A+, C+	30.21	10.47
		Undercontrolled	159	N++, E+, O+, A–, C–	28.75_{O}	9.70
		Overcontrolled	225	E–, O–	33.60_{U}	13.05
2.5	IPIP-BFM	Resilient	257	N–, E++, O++, A+, C+	29.75_{O}	10.30
		Nonresilient	190	N++, E-, C-	30.76	11.92
		Overcontrolled	242	N-, E–, O–, A-	32.88_{R}	11.93
3.1	BFAS	Resilient	304	N–, E++, O+, A+, C++	30.06	12.29
		Undercontrolled	240	N++, E-, O+, A+	29.33	12.39
		Nonresilient	263	E-, O–, A–, C-	29.75	13.20
	BFI-S	Resilient	306	N–, E+, O+, A++, C++	31.39_{U}	12.99
		Undercontrolled	253	N+, E+, O+, A–, C–	$24.28_{N,\ R}$	9.19
		Nonresilient	254	N+, E–, O–, A-	33.14_{U}	13.30
5	BFAS	Resilient	183	N–, E++, O++, A+, C++	31.40	13.35
		Undercontrolled	191	N++, E-, A+, C-	30.28_{N}	14.17
		Nonresilient	232	N-, E-, O–, A–	33.60_{U}	14.69
	BFI	Resilient	240	N–, E++, O+, A++, C++	32.47_{U}	13.63
		Undercontrolled	170	N++, E+, O+, A–, C–	$27.55_{N,\ R}$	12.05
		Nonresilient	197	N+, E–, O–	34.89_{U}	15.59

Note: Standardized Z values in the range of -.25 to .25 are not reported. Standardized Z values over .50 or below -.50 are marked with double signs (++ or –). Standardized Z values in the range of .25 to .50 or -.25 to -.50 are marked with single signs (+ or -). Traits with unexpected signs were underlined. Subscripts on the mean age indicate significant age differences between particular types (the subscript represents the first letter of the type label with a significant difference in age).

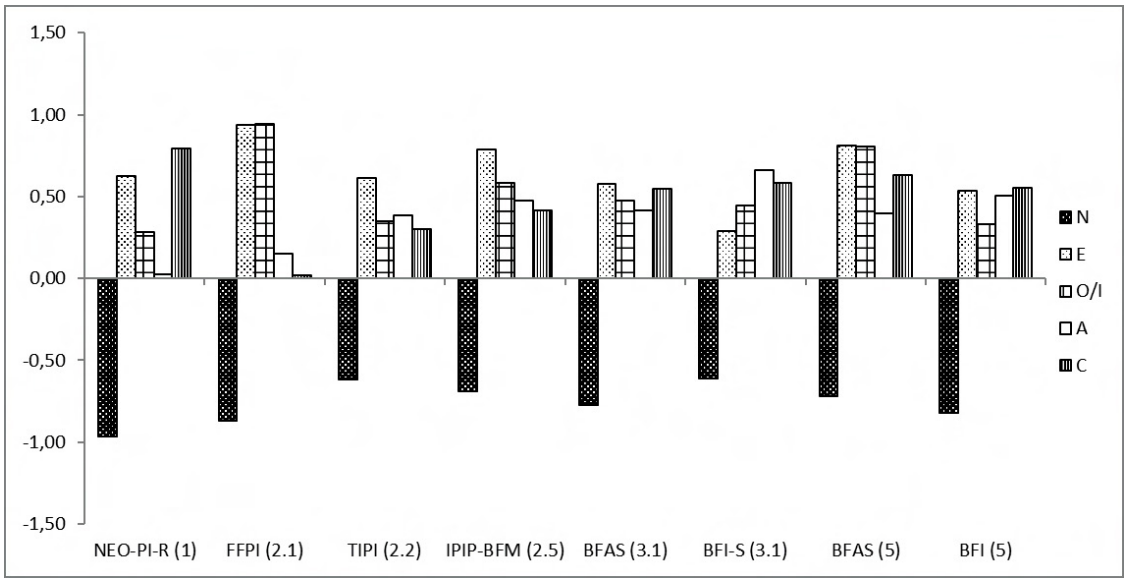

Figure 3. The Resilient personality type across different measures in the best replicated three-cluster solutions (the sample is indicated in brackets, see Table 3)

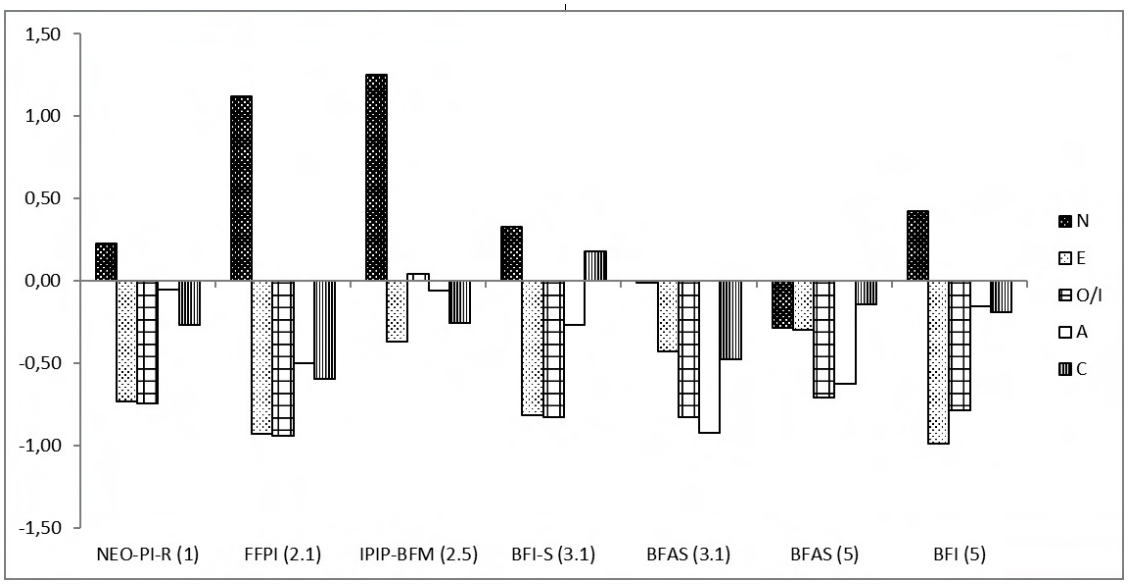

Figure 4. The Nonresilient personality type across different measures in the best replicated three-cluster solutions (the sample is indicated in brackets, see Table 3)

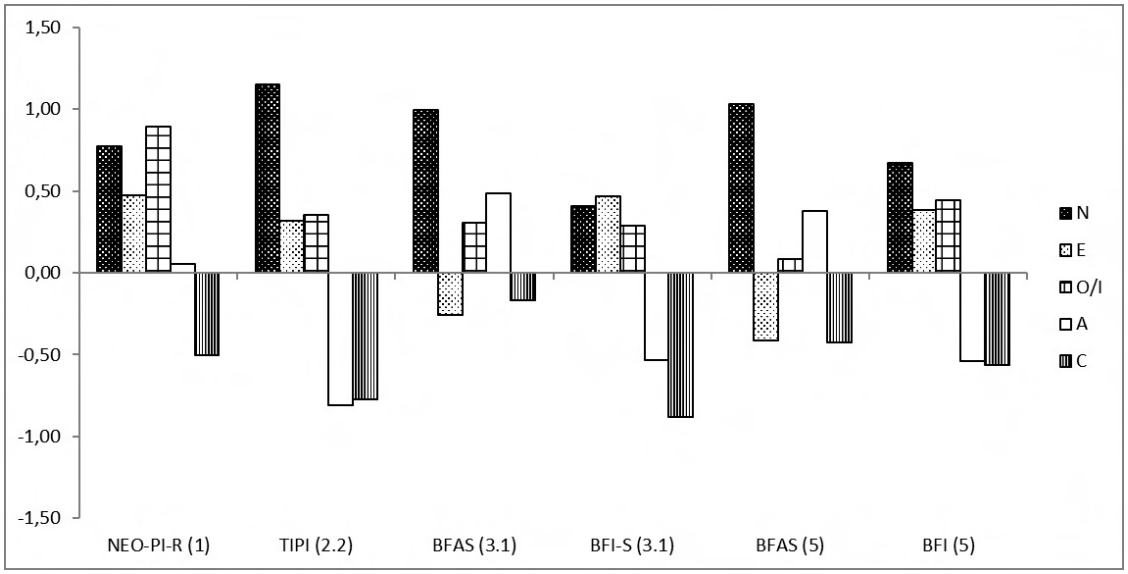

Figure 5. The Undercontrolled personality type across different measures in the best replicated three-cluster solutions (the sample is indicated in brackets, see Table 3)

(N-, E-, O-). However, this type also had an unexpected below average level of A.

It is worth noting that in all cases in which an Overcontrolled cluster was identified, it had the oldest average age of cluster members, differing significantly from the Undercontrolled (TIPI) or Resilient type (FFPI and IPIP-BFM in sample 2.5). The Undercontrolled type had the youngest aged cluster, in half of the cases having significantly younger members than the remaining clusters. In general, the Resilient type was represented by the largest proportions of the samples, whereas the Undercontrolled clusters had the least members (see Table 3).

Summing up, the above results generally support the RUO/RUN typology. However, they also provide some support for the RUNO typology which explains some of the anomalies found in the RUO/RUN clusters. Most importantly, these results are roughly in accordance with our main hypothesis, as unexpected configuration elements —i.e., a trait pole contradictory with the RUNO typology depicted in Figure 2—occurred in only 6% of the cases.

Four-cluster solution. The four-cluster solution was the most replicable in the IPIP-AB5C (sample 1), the two analyses on the BFQ-2 (samples 2.1 and 3.2), sample's 2.4 NEO-PI-R, as well as both measures used in sample 4 (IPIP-BFM and NEO-FFI). Both the Resilient and Nonresilient types were identified in all cases (see Table 4 and Figures 7 and 8). It is worth noting that their profiles were more coherent with the full expected FFM configuration and more consistent among different measures (especially in the case of the Nonresilient type) than in three-type solutions. Actually, in most cases the Resilient and Nonresilient types had the expected full five factor profiles in terms of not lower than |.25| differences of trait levels from the mean scores.

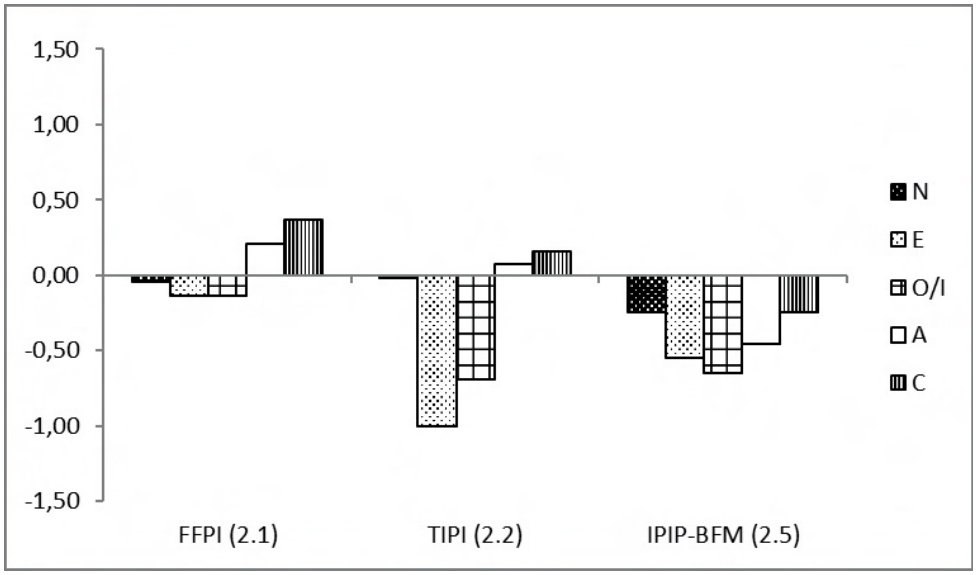

Figure 6. The Overcontrolled personality type across different measures in the best replicated three-cluster solutions (the sample is indicated in brackets, see Table 3)

Table 4. Personality profiles obtained in the best replicated four-cluster solutions

Sample	Measure	Type	N	Big Five scores	Age	
					M	SD
1	IPIP-AB5C	Resilient	192	N–, E++, O++, C+	$28.21_{O, U}$	10.88
		Undercontrolled	203	N++, E++, O+, C–	$25.93_{R, N, O}$	9.88
		Nonresilient	186	N+, E–, O–, A–, C–	32.95_{U}	15.07
		Overcontrolled	258	N-, E-, A+, C++	$35.59_{U, R}$	15.43
2.1	BFQ-2	Resilient	258	N–, E++, O++, A++, C++	32.01	11.46
		Undercontrolled	337	N++, E+, O++, A+	31.38	12.15
		Nonresilient	283	N++, E–, O–, A–, C–	32.23	11.99
		Overcontrolled	479	N–, E-, O-	32.59	11.84
2.4	NEO-PI-R	Resilient	125	N–, E++, O++, A++, C++	31.21_{U}	11.58
		Undercontrolled	178	N++, E++, O++, C-	$27.04_{O, N, R}$	8.38
		Nonresilient	188	N++, E–, O–, C–	33.21_{U}	12.47
		Overcontrolled	234	N–, O–, C+	32.27_{U}	11.47
3.2	BFQ-2	Resilient	97	N–, E++, O++, A++, C++	30.40	12.84
		Undercontrolled	149	N++, E+, O++, A++, C+	28.07	11.98
		Nonresilient	165	N+, E-, O–, A–, C–	29.04	12.68
		Overcontrolled	155	N–, E-, O-	30.93	13.46
4	NEO-FFI	Resilient	178	N–, E++, O++, A++, C++	30.01_{U}	11.55
		Undercontrolled	155	E++, O++, C–	$25.21_{O, N, R}$	9.54
		Nonresilient	210	N++, E–, O-, A-, C-	$28.78_{U, O}$	12.57
		Overcontrolled	240	N-, E-, O–, C+	$33.04_{U, N}$	9.54
	IPIP-BFM	Resilient	250	N–, E+, A+, C++	32.75_{O}	12.99
		Undercontrolled	166	N++, O+, C-	$26.06_{N, R}$	9.83
		Nonresilient	196	N+, E–, O–, A–	32.95_{O}	14.53
		(quasi) Overcontrolled	165	N–, E++, O++, A+, C–	$24.70_{N, R}$	7.36

Note: Standardized Z values in the range of -.25 to .25 are not reported. Standardized Z values over .50 or below -.50 are marked with double signs (++ or –). Standardized Z values in the range of .25 to .50 or -.25 to -.50 are marked with single signs (+ or -). Traits with unexpected signs were underlined. Subscripts on the mean age indicate significant age differences between particular types (the subscript represents the first letter of the type label with a significant difference in age).

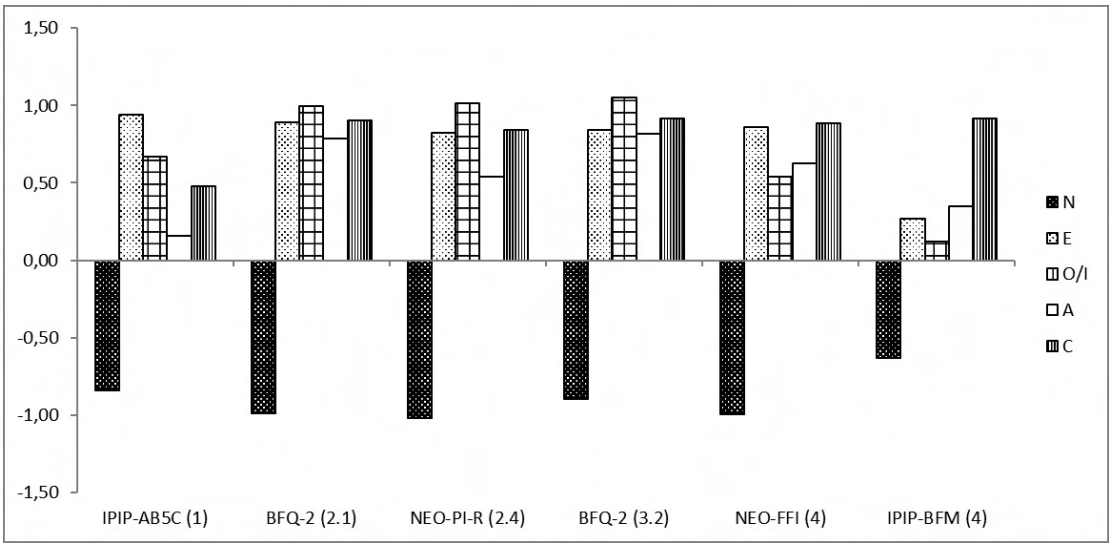

Figure 7. The Resilient personality type across different measures in the best replicated four-cluster solutions (the sample is indicated in brackets, see Table 4)

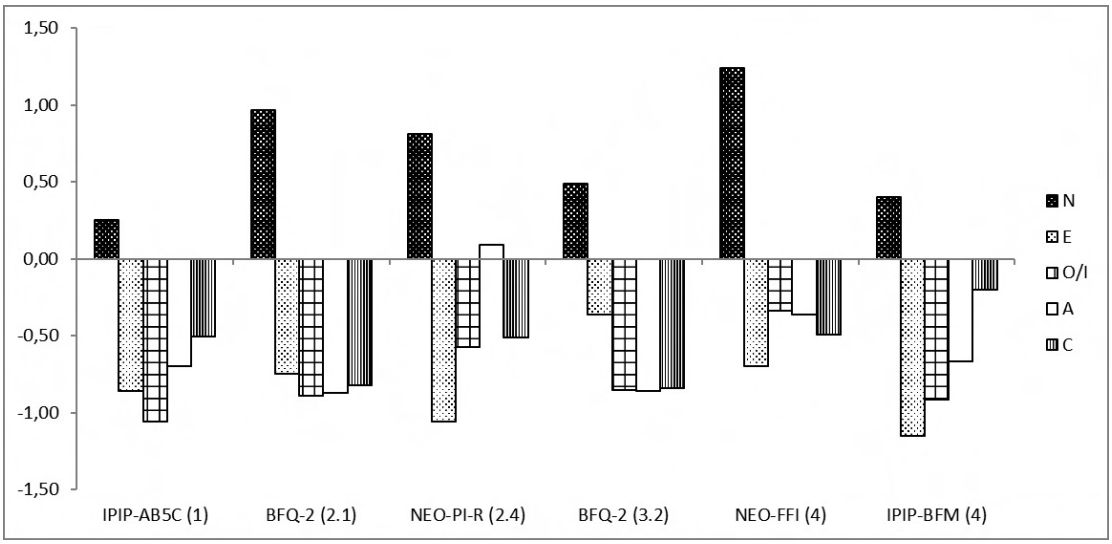

Figure 8. The Nonresilient personality type across different measures in the best replicated four-cluster solutions (the sample is indicated in brackets, see Table 4)

The Undercontrolled type also appeared in all six cases of four-cluster solutions (see Table 4 and Figure 9). Consistent with our expectations, in most cases this type was characterized by high N, high O, above average E, and below average C. On the other hand, only the NEO-PI-R (sample 2.4) yielded almost full expected configuration and we also found a few anomalies for the Undercontrolled type in other measures. For example, the level of A was average in most cases, and in the two BFQ-2 profiles A was even above average. These two BFQ-2 cases are the most inconsistent with the expected Undercontrolled profile, and in particular the BFQ-2 configuration obtained in sample 3.2 where we found not only high A, but also an above average level of C.

Finally, we were able to identify the Overcontrolled prototype in five out of six of the four-clusters solutions, namely in the analyses of the IPIP-AB5C, sample's 2.4 NEO-PI-R, the NEO-FFI, as well as both cases of the BFQ-2 (see Table 4 and Figure 10). Moreover, characteristics of this cluster were more consistent with expectations than in three-cluster solutions. In all five cases, Overcontrollers displayed low (mostly) or below average N, and in most cases also low or below average O, below average E, and elevated (above average) C. On the other hand, only the IPIP-AB5C yielded almost full expected configuration and only in this case was the level of A moderately high (i.e., above average; in the remaining four cases it was average). In the sixth case (i.e., the only one practically without Overcontrolled type), the IPIP-BFM (sample 4) identified a profile which blends the characteristics of the Resilient and Undercontrolled types rather than Overcontrolled type, with low N and elevated A, but high E and O, as well as low C (see Table 4 and right side of Figure 10). Taking the fact that this type only appeared once, we deemed it an anomaly.

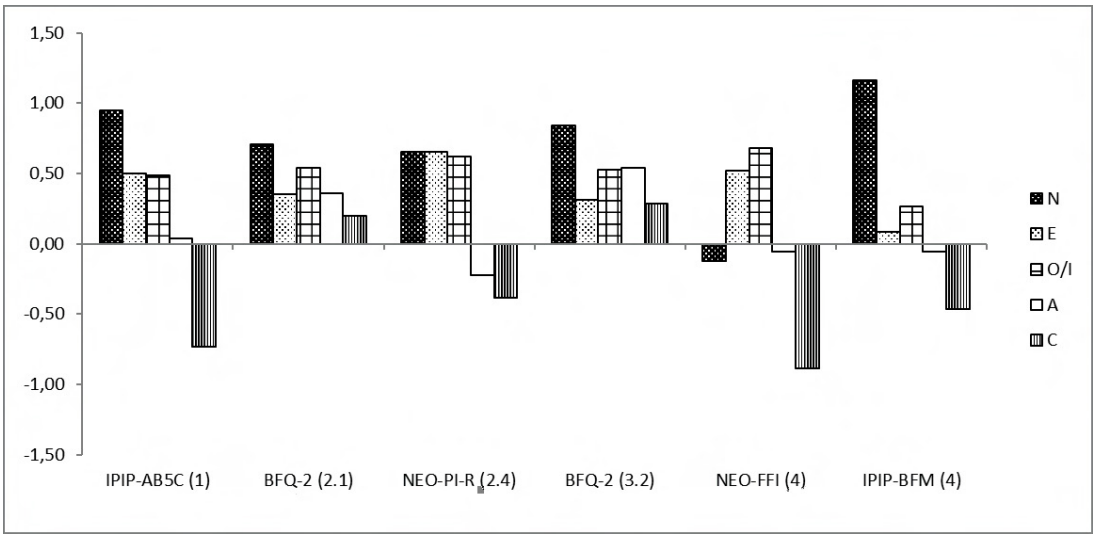

Figure 9. The Undercontrolled personality type across different measures in the best replicated four-cluster solutions (the sample is indicated in brackets, see Table 4)

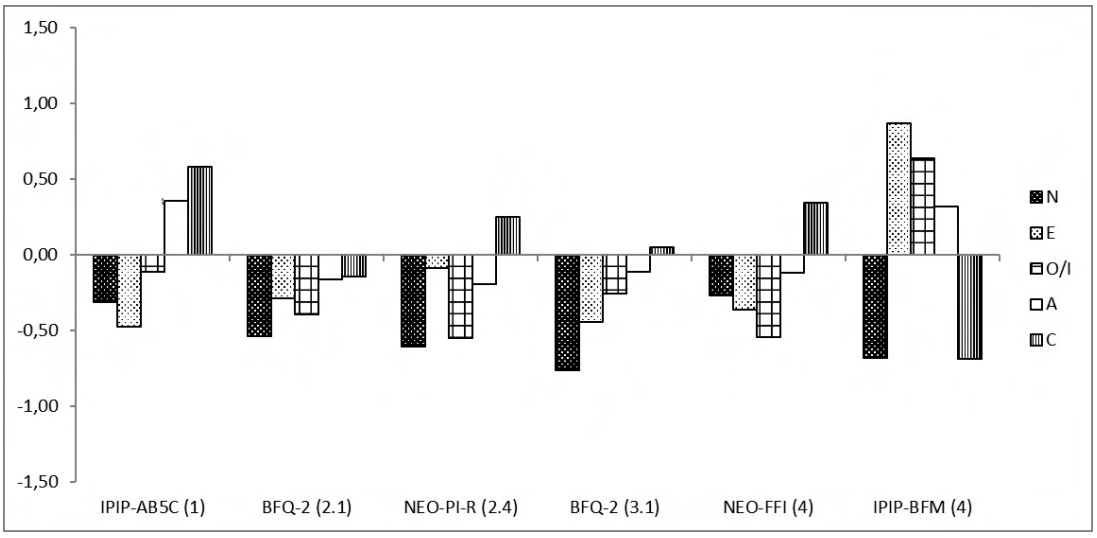

Figure 10. The Overcontrolled personality type across different measures in the best replicated four-cluster solutions (the sample is indicated in brackets, see Table 4)

Note: in case of the IPIP-BFM (sample 4) the Resilient-Undercontrolled rather than Overcontrolled type was obtained.

Regarding the age differences between types, again, the Undercontrolled cluster members were the youngest, and in half of the cases Undercontrollers were significantly younger in relation to all remaining clusters. In turn, the Overcontrolled cluster members were typically the oldest, however, only in two cases they were significantly older not only in comparison to the Undercontrollers, but also compared to members of some other cluster (Resilient or Nonresilient; see Table 4).

In general, the results presented in this section support the RUNO typology, with only 6% (6/101) of the profile elements being in contradiction with the main hypothesis. The Resilient and Nonresilient types emerged in the most evident and consistent forms. However, the Overcontrolled type also appeared in almost all cases of four-cluster solutions and its consistency with the expected profile was comparable to the Undercontrolled type. Additionally, in contrast to the three-cluster solutions, in the four-cluster solutions the Overcontrolled type was represented by the largest number of participants in most (i.e., four of six) cases, while in three cases the smallest proportions had the Resilient type (see Table 4).

Five-cluster solution. The five-cluster solution was the least replicable solution as it showed the best replicability in only two cases: the BFI-S from sample 1 and the IPIP-NEO-PI-R (sample 2.3; see Table 5 and Figures 11 and 12). However, we were able to easily identify the four previously described RUNO types: Resilient, Nonresilient, Undercontrolled and Overcontrolled in both cases. What is more, these clusters were generally very consistent with their expected full five-dimensional profiles. Namely, there were four (BFI-S) and five (IPIP-NEO-PI-R) traits with levels differing from average in the expected direction for the Resilient type; there were four such traits in both the BFI-S and the IPIP-NEO-PI-R for the Undercontrolled type; four and three for

Table 5. Personality profiles obtained in the best replicated five-cluster solutions

Sample	Measure	Type	N	Big Five scores	Age	
					M	SD
1	BFI-S	Resilient	193	N–, E++, O++, A+	$30{,}02_{O}$	12,99
		Undercontrolled	167	N++, E++, O+, C-	$28{,}49_{O/N,\ O}$	13,04
		Nonresilient	164	E-, O–, A–, C–	$28{,}76_{O/N,\ O}$	12,91
		Overcontrolled/ Nonresilient	142	N++, E–, C++	$33{,}99_{U,\ N}$	15,00
		Overcontrolled	179	N–, E–, O–, A+, C+	$34{,}09_{U,\ N,\ R}$	14,17
2.3	IPIP-NEO-PI-R	Resilient	144	N–, E++, O+, A++, C++	$32{,}75_{U,\ N1}$	11,29
		Undercontrolled	209	E++, O++, A–, C-	$26{,}96_{R,\ N1,\ O}$	8,27
		Nonresilient	232	N+, E–, O–	$37{,}33_{U,\ N2,\ R}$	12,45
		Nonresilient 2	129	N++, E–, O+, C–	$30{,}34_{N1,\ O}$	11,37
		Overcontrolled	259	A++, C+	$35{,}51_{U,\ N2}$	13,28

Note: Standardized Z values in the range of -.25 to .25 are not reported. Standardized Z values over .50 or below -.50 are marked with double signs (++ or –). Standardized Z values in the range of .25 to .50 or -.25 to -.50 are marked with single signs (+ or -). Traits with unexpected signs were underlined. Subscripts on the mean age indicate significant age differences between particular types (the subscript represents the first letter of the type label with a significant difference in age).

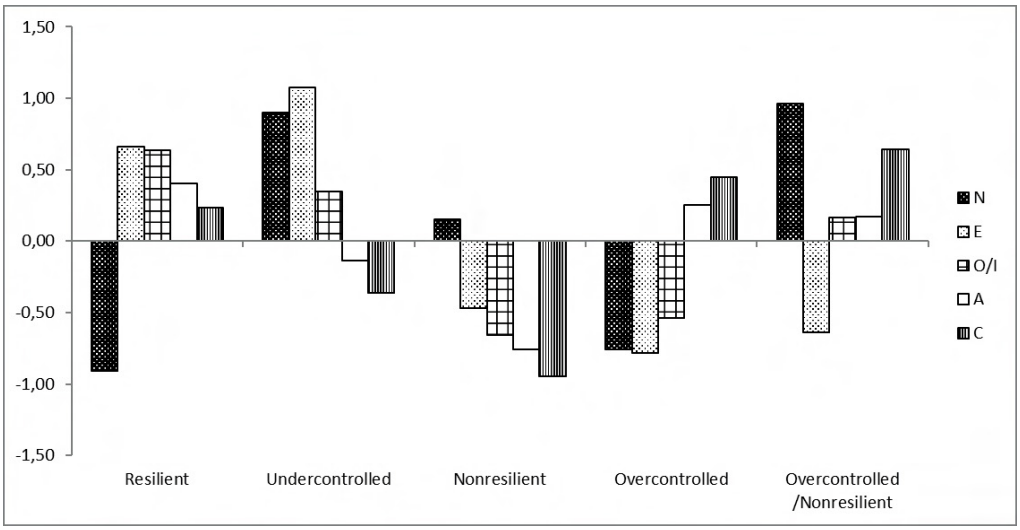

Figure 11. Personality types in the best replicated five-cluster solution for the BFI-S in sample 1

the Nonresilient type, and five and two, respectively, for the Overcontrolled type.

Additionally, we found a mixed Overcontrolled/ Nonresilient type in the BFI-S, with high N, low E, and high C, as well as another version of the Nonresilient type in the IPIP-NEO-PI-R, with high N, low E, low C and above average O (see Table 5 and Figures 11 and 12). These fifth types were the only ones that contain elements contrary to the main hypothesis. What is more, in both cases these fifth types were represented by the smallest proportion of the samples. In turn, the Resilient type represented the largest proportion in the BFI-S while the Overcontrolled type was the largest proportion in the IPIP-NEO-PI-R (Table 5).

There were many significant age differences between the clusters. Consistent with other solutions, the Undercontrollers were amongst the youngest groups and the Overcontrollers amongst the oldest with significant differences between both.

CONCLUSIONS

The results of the research presented above provide the foundation for two main conclusions. First, the robustness of the empirically derived personality typology is limited, as the measurement instruments, samples, and statistical procedure (data standardization) all play an important role in the obtained solutions. Second, we found that our main hypothesis was generally confirmed, as the vast majority of the obtained profiles were in accordance with the configurations predicted by the RUNO typology (see Figure 2). Overall, in only 6% of all cases did an unexpected element (i.e., pole of the trait that was contradictory to the prediction) of the profile occur.

Indeed, the three-type RUO/RUN typology, which is predominant in the literature (Alessandri & Vecchione, 2017; Donnellan & Robins, 2010), was found most often across measures, samples, and procedures in our study. However, in many cases, the most replicable solution was

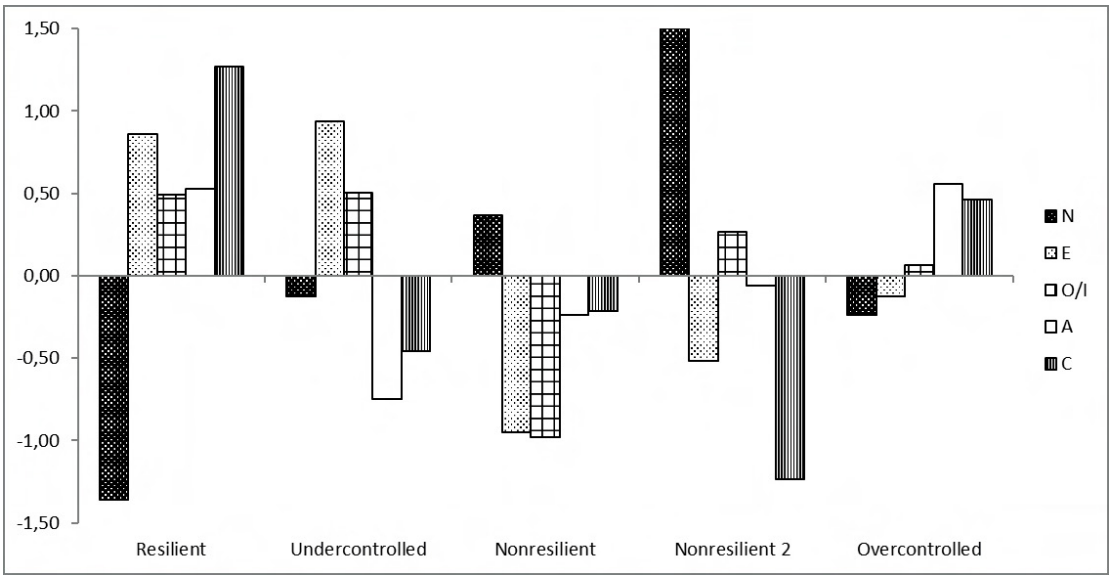

Figure 12. Personality types in the best replicated five-cluster solution for the IPIP-NEO-PI-R in sample 2.3

the four-cluster one, which has also been previously reported (see Barbaranelli, 2002; Gramzow et al., 2004; Isler, Liu, Sibley, & Fletcher, 2016; Zawadzki, 2016, 2017). In these four-cluster solutions, the fourth, Overcontrolled type (using the RUNO relabeling) occurred almost as often as the other three types. Moreover, the Overcontrolled type did not only appear in the four-cluster solutions as it was also present in some three-cluster solutions (instead of the Undercontrolled or Nonresilient types), as well as in both of the obtained five-cluster solutions. Importantly, in three-type solutions the Resilient type was generally the largest cluster, while in the four-type solutions the Overcontrolled type mostly had the largest number of participants. This suggests that when we increase the accuracy of classification some of the Resilient type members could turn out to be Overcontrollers. The fact remains that the fourth, Overcontrolled type is generally observed less often than the other three types – both in the current study as well as in previous research – and RUO/RUN typology is the most replicated solution. However, there is some ground to expect that samples with a more representative age distribution will be more likely to reveal Overcontrolled type as it is more common in older people, yet research on personality types is mainly conducted on adolescents, students or young adults (see Gramzow et al., 2004; Herzberg & Roth, 2006; Sava & Popa, 2011; cf. Steca, Alessandri, & Caprara, 2010). Indeed, the results of the current study indicate that Overcontrollers had the highest average age in the majority of analyses, whereas Undercontrollers were the youngest, and this age effect was observed despite the fact that our samples were dominated by relatively young participants (mean age of ~30 years). Taking into account the above, as well as the fact that RUO/RUN types are completely contained within the RUNO solution (see Figure 2), the latter appears to be the most justified personality typology.

Nevertheless, the limited robustness of the cluster solutions obtained across the measures, samples and statistical procedures gives rise to serious doubts about whether the empirical determination of personality typology is sufficient. Perhaps the time has come to move forwards from the exploratory studies and to instead focus on the theoretical basis for predicting the number and content of personality prototypes understood as common (or the most often met) configurations of the FFM dimensions. Regarding the RUO three-type typology, although it is empirically derived from trait data, its origin and justification rich the *ego-resiliency* and *ego-control* constructs from the self-regulatory theory of ego properties by the Blocks (Block & Block, 1980). In contrast, the four-type RUNO typology corresponds to the classical Hippocrates–Galen temperament typology as well as new models built directly on the basis of the FFM (not outside as in the case of the Blocks' theory), i.e., TFM (Cieciuch & Strus, 2017; DeYoung, 2005), and CPM model (Strus & Cieciuch, 2017; Strus et al., 2014a). At any rate, the renewed focus on theoretical basis of personality typology seems to be necessary to further advance this field of research. Maybe the way to achieve this purpose leads through the fully cohesive integration of the concepts of trait (attribute-centered approach) and type (person-centered approach).

Limitations and further directions

Our study is not free of limitations. The one-nation origin of the sample limits the generalizability of our findings and further research should verify them in other populations, and cultures. All measures used in the present study were self-reported, and future research could apply an other-informant approach. Moreover, we used the WHCA procedure – as the predominant method in the literature – in order to obtain comparable results and to verify findings from the majority of previous research. However, further research could verify our results through

applying newer and more advanced procedures or clustering algorithms, such as LPA or LCA (e.g., Leikas & Salmela-Aro, 2014; Specht et. al., 2014) or others (Gerlach et al., 2018). Finally, future studies should embrace the predictive power (and external validity) as well as underlying mechanisms (or intrapsychic processes) of personality types recognized within four-type RUNO (and three-type RUO) typology. It is possible that direct (and quantitative) measurement of personality types would facilitate the process of achieving above research goals. The CPM model and measures offer some solutions in this respect (see Strus & Cieciuch, 2017; Strus et al., 2014a; Strus et al., 2021).

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