
PERSONALITY TYPES BASED ON THE BIG FIVE MODEL. A CLUSTER ANALYSIS OVER THE ROMANIAN POPULATION

*Florin A. SAVA**, *Radu I. POPA*

West University of Timișoara, Timișoara, Romania

ABSTRACT

This paper reports two independent studies investigating personality types using cluster analysis based on the five-factor personality model. In the first study, we focused on identifying the most appropriate cluster number by checking the replicability of two to eight clusters across two random halves of a nationally representative Romanian sample. The second study established the external validity of the more replicable three-cluster and five-cluster solution by studying their relations to specific self-reported behaviors. The results indicate good validity for a five-cluster solution describing the following personality types: resilient, undercontrolled, strain, overcontrolled, and passive. The findings are discussed in relation to a suggested classification based on degrees of self-control and of adaptation / flexibility.

KEYWORDS: *Five-factor personality model, Big Five, cluster analysis, personality type, resilient type, DECAS Personality Inventory*

TRAITS VS. PERSONALITY TYPES

Personality psychology is currently dominated by a dimensional approach to personality description in which the scores for each personality trait are usually considered in isolation. This type of analysis reflects initial intuition because individuals have a tendency to evaluate others by focusing on only one dimension (e.g., George is friendly). Although there is often a correspondence between the score obtained for a given dimension and a particular behavioral descriptor (e.g., individuals with high scores on Agreeableness Scale are often perceived as being friendly), this is not always the case because other relevant factors are ignored. For

* Corresponding author:
E-mail: afsava@socio.uvt.ro

example there is a much higher probability that an individual will be described by others as being friendly if he or she obtains high scores on both the Agreeableness and Extraversion scales. By contrast an individual with high agreeableness but low extraversion will tend to be perceived as docile or conformist.

Combinations of factors can therefore provide us with more information than we can obtain by interpreting a given scale in isolation. A personality type, from this perspective, is described in terms of unique combinations of traits. In practice, the best known are probably the 16 personality types described by the Myers-Briggs Type Indicator (MBTI) (Briggs Myers, McCaulley, Quenk, & Hammer, 1998), but this typology has been criticized in the academic world due to a series of shortcomings concerning its scientific validity (Hunsley, Lee, & Wood, 2004). Other familiar personality type descriptions are those proposed in the California Personality Inventory (CPI) - alpha, beta, gamma, and delta (Gough & Bradley, 1996, as cited in Pitariu, Iliescu, Tureanu, & Peleasa, 2006), those proposed by Eysenck (1967), based on an ancient temperament typology, and those proposed by Block and Block (1980) – brittle undercontrollers, brittle overcontrollers, resilient undercontrollers, and resilient overcontrollers.

Research on personality types belongs to the person-centered tradition in personality research and focuses on those types that are frequently observed in a population. Previous studies comparing the predictive power of trait vs. type approach reported mixed results (Huey & Weisz, 1997) or suggested similar predictive power both in terms of the multivariate percentage of explained variance and the number of significant longitudinal correlates (Asendorpf & Denissen, 2006), while a study conducted by Costa, Herbst, McCrae, Samuels, and Ozer (2002) favored the dimensional approach. Asendorpf and Denissen (2006) considered that the type approach did better when predicting longitudinal compared to concurrent outcomes due to the fact that a type is dependent on pattern of traits and not on the mean-level tendencies that might fluctuate across time as it is the case for traits.

In our opinion, the fact that the type approach was relatively on par with the variable approach is remarkable. After all, the dimensional approach allows for more predictors (usually those included in the five-factor model), which are assessed in a fine-grained manner (continuous variables), while the most common type approach (Block's typology) usually involves only three types measured as categorical variables.

PERSONALITY TYPES AND THE FIVE-FACTOR PERSONALITY MODEL

Although the Big-Five model is an atheoretical dimensional model, various attempts have been made to establish a personality typology based on particular combinations of the five personality traits (Asendorpf, Borkenau, Ostendorf, & van

Aken, 2001; Asendorpf & Van Aken, 1999; Avdeyeva & Church, 2005; Barbaranelli, 2002; Block, 1995; de Fruyt, Mervielde, & van Leeuwen, 2002; Herzberg & Roth, 2006, Pulkkinen, 1996; Robins, John, Caspi, Moffitt, & Stouthamer-Loeber, 1996). Almost all these attempts refer back to Block and Block's (1980) personality typology.

The best-known classification of personality types, based on the Big-Five model, identifies only three gender-indifferent personality types (Asendorpf & Van Aken, 1999; de Fruyt, Mervielde, & van Leeuwen, 2002, Robins et al., 1996). This typology differentiates between personality types described as resilient, overcontrolled, and undercontrolled. This classification is based on Block and Block's proposal (1980), which focused, in one dimension, on Ego resiliency (the degree of an individual's flexibility and adaptation towards the demands of the environment) and in another on Ego control (the intensity with which impulses and wishes are expressed – measured along an axis that has self-discipline at one end and impulsivity / explosive behavior at the other).

The specific typology for the resilient personality is indicated by scores above the average for all the Big-Five dimensions, except for neuroticism - a dimension in which resilient people obtain low scores. The typology for the overcontrolled personality typically involves below average scores for extraversion combined with above average ones for the traits of neuroticism and conscientiousness, the other two trait dimensions being less relevant for describing this type. Finally, the profile of the undercontrolled personality type is usually characterized by low agreeableness and conscientiousness in combination with high levels of neuroticism and extraversion.

However, this typology suffers from shortcomings, concerning (a) differences between studies in the number of identified clusters, (b) inappropriate labeling of clusters, (c) differences in cluster-analytic methods, and (d) disregard for possible cultural differences. We will address these four issues in turn.

Although the most commonly proffered solutions suggest a three-cluster typology, Pulkkinen (1996) describes seven personality types (with twelve personality subtypes) while a recent study using a nationally representative German sample suggests a five-cluster solution (Herzberg & Roth, 2006).

Even those studies that provide a three-cluster solution seem to suffer from a labeling problem. One conclusion of Herzberg and Roth (2006), in their review of the literature, is that in many instances prototypes with differently detailed profiles have been assigned the same names as used in previously described work, apparently in order to align the new findings to a three-cluster solution. For instance, the undercontrolled type as described by Asendorpf et al. (2001) had a high level of neuroticism, a very high level of extraversion and an average level of agreeableness, whilst the same type label was used by de Fruyt, Mervielde, and van Leeuwen (2002) for a type having an average level of neuroticism and lower levels

of extraversion and agreeableness. The significance of these disparities is all the greater given that the trait measures were obtained in both studies using the same instrument, the NEO PI-R, (the most widely-used inventory for assessing the five-factor model of personality).

Another interesting finding is reported by Rammstedt, Riemann, Angleitner, and Borkenau (2004), who found that a three-cluster solution with clearly identified profiles in terms of resilient, undercontrolled and overcontrolled types was found only when self-report measures were used, and that personality types which emerge from the analysis of data depend strongly on personality measures and informants.

Some authors, such as Costa et al. (2002), argue that the cluster-analytic methods affect the results. For instance, cluster analysis is sensitive to sample size and composition. Most of the findings that support a three-cluster solution have been based on samples which were rather small (< 500) and of relatively homogeneous composition (e.g., college students, rather than a representative population sample). In fact the only published study based on a national representative sample was conducted in Germany (Herzberg & Roth, 2006) and its results suggest that a five-cluster solution is a better fit than a three-cluster solution. Another technical issue was raised by Breckenridge (2000), who demonstrated that selecting the number of clusters on the basis of Cohen's kappa replication index, as suggested by Asendorpf et al. (2001), introduces a strong bias towards choosing fewer clusters. A solution to these limits would be the use of a more liberal kappa value. Although Asendorpf et al. (2001) recommended .60 as a cut off value to justify a cluster solution, such a value seems to be rather technically conservative, and therefore we a priori chose a cut off value of .50 for mainly two reasons: (a) kappa coefficients are highly sensitive to sample composition and tend to get lower values for more heterogeneous samples (as in the case of our national representative sample) (Boehm, Asendorpf, & Avia, 2002); (b) kappa indices are biased towards choosing fewer clusters, as (Breckenridge, 2000) demonstrated, thus leading to an underestimate of the correct number of clusters if conservative cut off values are used.

Last, but not the least, the cultural argument discussed by Avdeyeva and Church (2005) addresses the cross-cultural generalizability of such findings. The authors note that none of the previously published studies had been conducted in a non-western culture, and more seriously that the instruments used in previous studies had been developed originally in American English which may bias the results. Moreover, the same authors have conducted the only published study on a non-western culture and found only partial support for the usual three-cluster solution, in that the profiles for the undercontrolled and overcontrolled types differed from the previously found profiles of these types.

OBJECTIVES AND RESEARCH DESIGN

In our first study, we focused on identifying the most appropriate cluster number starting from Block's (1980) typology, as well as establishing a proper label for each cluster in a Romanian sample.

As Asendorpf (2001) affirmed, the consistency of personality types across different studies is far from being perfect, mainly because different studies may differ in (i) language, (ii) culture, (iii) selectivity and size of the sample, (iv) instrument of trait assessment, (v) judge (self or others), and (vi) method of deriving types.

In order to look for the impact of five out of six above-mentioned aspects (we based our study entirely on self-report measures) and to overcome the previously mentioned limitations: (a) we conducted the analysis on a nationally representative population sample in order to be in a position to extract the best cluster number, especially from the point of view of replicability; (b) we used a more liberal cut off value for Cohen's kappa for identifying the most appropriate number of clusters as more appropriate when studying a large, heterogeneous sample; (c) we conducted our study in a non-English-speaking country, using an indigenous instrument to measure the Five-factor model of personality, and (d) we addressed the issue of labeling the resulting clusters based on a more objective basis, by computing their degree of similarity with a typical personality type (profile) as resulted from literature review related to Block and Block's (1980) model.

Based on these characteristics we will provide further evidences related to the opportunity to continue considering the Block and Block's (1980) typology a reference framework for interpreting the personality types derived from a five-factor model of personality.

Finally, considering arguments by Herzberg and Roth (2006) and by Hair, Anderson, Tatham, and Black (1998), we did not only study the replicability of cluster solutions, but also checked in a second study how well cluster membership of participants predicted specific behaviors. This would provide evidence that the different uncovered types are predictive of real life differences between types.

STUDY 1

METHOD

Participants

The randomly selected sample of 1,073 participants was representative of the Romanian population in terms of distribution of gender, age, ethnographically significant regions, and milieu (urban vs. rural). However the questionnaire was administered only to a population of participants between 16 and 60 years of age

and who had at least ten years of formal education. The percentages obtained for each sample category were: 49.3% (urban) and 50.7% (rural); 26.5% (16-25 years), 34.2% (26-40 years), and 39.3% (41-60 years). The gender distribution was 50.1% males and 49.9% females. The wider context of the research had as its main objective the establishing of national representative norms for the DECAS Personality Inventory through the use of a stratified multi-stage probability design as a sampling procedure. Thus, in the first stage explicit stratification was employed by using several strata variables that are usually taken into account when running national surveys (e.g., geographical region, the milieu, the population size for the cities etc.). This measure allows a random selection of independent samples for each stratum. During the second stage, a simple random sample of localities was drawn in order to cover all combination of strata (e.g., cities with less than 50,000 inhabitants from Transylvania region). The next stage involved a systematic probabilistic sample procedure to select households from the selected locations (e.g., every fifth household), by using multiple randomly chosen starting points to cover both center and the suburbs of the selected locations. Finally, the last step used gender and age as strata, in order to reproduce the proportions of these demographics in accordance with data provided by the last national census. In this last step, one person per selected household was asked to respond, based on a simple probabilistic procedure (e.g., interviewing the person who has celebrated his or her birthday more recently). The design of the sampling procedure and the implementation of the field survey (collection of data) were subcontracted by two specialized survey companies.

Instruments

All participants in the study were tested using the DECAS Personality Inventory and a questionnaire addressing demographic characteristics. DECAS (Sava, 2008) is a 95 item test which solicits dichotomic (“true” / “false”) answers to items equally distributed among five content scales: openness; extraversion, conscientiousness, agreeableness and emotional stability (as opposed to neuroticism) that have been developed based on the factor analysis framework. The internal consistency of the scales within this sample ranges from .70 for conscientiousness to .75 for emotional stability, and the six week test-retest stability coefficients range from .79 to .91, the later being obtained on a smaller convenience sample. The questionnaire also comprises three validity scales measuring social desirability, random responding, and acquiescence. The validity of the DECAS scales was confirmed in a study that included, among others, the DECAS, the BFQ (Caprara, Barbaranelli, & Borgogni, 2008), Goldberg's IPIP items (Goldberg, 1999), and the NEO-FFI (Costa & McCrae, 1992). Table 1 reports the mean and the range of the correlations between corresponding scales in the different instruments to measure the Big Five, the left column referring to correlations of the five DECAS scales with the corresponding scales in the other instruments, and the right column

referring to the correlations among the corresponding scales in the other instruments. None of the differences between the averaged correlations in the same row was significant. Likewise, a confirmatory factor analysis including scale scores from three instruments which were developed based on the big five model: DECAS (Sava, 2008), Goldberg's IPIP (Goldberg, 1999), and BFQ-2 (Caprara, Barbaranelli, & Borgogni, 2008) revealed that the five correlated factors solution provides a rather good model fit, with all specific scales (e.g., extraversion scales) loading more than .40 on their expected corresponding dimension (e.g., extraversion latent variable). Supplementary data describing the psychometric features of the test can be found in Sava (2008).

Table 1.

Correlations of the DECAS with other instruments (BFQ-2, IPIP, NEO FFI) and correlations of the other instruments among each other (mean N = 163)

DECAS Scale	r mean and range for correlating DECAS with other scales	r mean, correlations of the other instruments among each other *	z **
DECAS N	.65 (.54 - .72) (BFQ S – NEO FFI S)	.73	1.37 ns
DECAS E	.67 (.59 - .81) (BFQ E – NEO FFI E)	.68	0.16 ns
DECAS O	.64 (.54 - .74) (IPIP O – NEO FFI O)	.68	0.63 ns
DECAS A	.50 (.45 - .57) (BFQ A – NEO FFI A)	.56	0.75 ns
DECAS C	.65 (.62 - .66) (IPIP C – NEO FFI C)	.66	0.15 ns

* *Correlations involving scales to measure emotional stability were inverted to prevent negative correlations (N - neuroticism, E - extraversion, O - openness, A - agreeableness, C - conscientiousness)*

** *z value testing for differences between two average correlation coefficients*

Procedure

The first step consisted in eliminating invalid cases from the sample. The two criteria for considering a case as invalid were: (1) cases having a social desirability score over two standard deviations above the average; (2) unusual cases ("outliers"), at a $p < .00$ level based on Mahalanobis distance statistics. The second step consisted of creating standardized z scores following a procedure described in Urbana (2004), specific to situations in which the shape of data distribution is not normal. However, such a procedure goes against the suggestion made by Asendorpf et al. (2001) who explicitly recommend analyzing the raw scores in order to increase the chance of replicating a three-cluster solution. This recommendation was challenged by Costa et al. (2002), who consider it a potential source of methodological artifact; they also state that a cluster analysis solution based on z-standardized data is more appropriate when calculating kappa indices.

The remaining cases (1039 participants), were randomly allocated to two sub-samples: sample A (N = 519), and sample B (N = 520). The working algorithm required double cross-validation (Barbaranelli, 2002; Hair, et al., 1998). In this procedure one sub-group is used to generate the results and the other to confirm them. The procedure is then reversed so that each sub-group is considered in turn as the “primary” sample and the other as the “validation” sample. K-means analyses were performed on both sub-samples as a follow-up to the application of Ward’s algorithm. This was based on Asendorpf et al. (2001) recommendations which were applied in most subsequent similar studies (Barbaranelli, 2002; Rammstedt et al., 2004; Schnabel, Asendorpf, & Ostendorf, 2002), and became conventional for such purpose (Roth & Herzberg, 2007). More detailed information about the problems that must be considered when choosing various clustering methods is presented in Mandara (2003).

Results

For processing the data SPSS (SPSS 11.0, 2001) was used for selecting the optimum number of clusters.

Table 2.
Descriptive indicators for different solutions, ranging from 2 to 8 clusters

Task involved	Indices	2	3	4	5	6	7	8
Cross-validation samples								
Primary A sub-sample (N = 519)	kappa	.63	.63	.47	.50	.34	.35	.29
Primary B sub-sample (N = 520)	kappa	.53	.43	.47	.58	.46	.51	.43
Average kappa values (N = 1039)	kappa	.58	.53	.47	.54	.40	.44	.31

Table 2 presents the main findings from analyzing three sets of data: (a) the cluster solution based on replicating the findings from sub-sample A on sub-sample B (cross-validation); (b) the cluster solution based on replicating the findings from sub-sample B on sub-sample A (double cross-validation); (c) the cluster solution resulted from a k-means analysis of the entire sample (N = 1019) taking as starting points the means of the cluster seeds for the two sub-samples.

We can notice from table 2 that only three of the solutions (two, three and five clusters) have kappa values for the entire sample solution greater than the pre-established level of .50, although the three-cluster solution has a wider range for kappa values if sub-samples are taken into account (from .43 to .63).

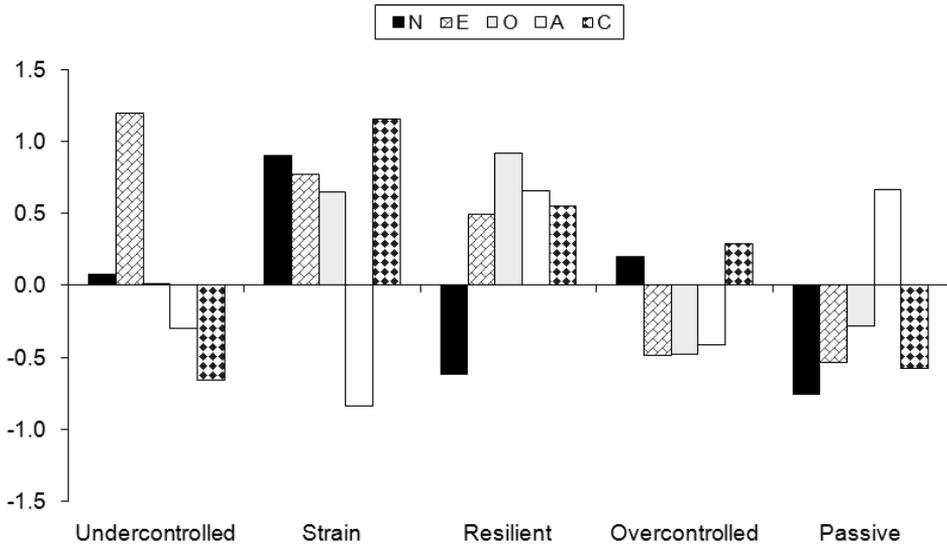


Figure 1.

Prototype expressed in z scores for the five identified personality types (N - Neuroticism; E - Extraversion; O - Openness; A - Agreeableness; C - Conscientiousness)

Therefore, when we consider the degree of stability of solutions (kappa values) for the entire sample only three of the cluster solutions: with two, three, and with five clusters show good internal validity. It seems, however, that less confidence can be placed in the two-cluster than in the other two remaining solutions, given that in a two-cluster solution the trait profile of the one type would then be the mirror image of the trait profile of the other type, therefore an artefact. The resulting modal values of the personality types are presented in figures 1 and 2.

As a means of further checking the appropriate labeling for the clusters in our solution we computed two additional parameters: the Euclidean distance and linear correlations between the z values that characterize each resulted cluster and those of the five-cluster solution provided by Herzberg and Roth (2006), as well as the median z values for the three-cluster solution resulting from eleven different profiles reviewed by the same authors (e.g. for resilient people we estimated a z score of .37 for extraversion based on the fact that this value represents the median E score of the resilient across all 11 studies reviewed by Herzberg and Roth (2006). Pearson correlations (r) between two profiles beyond .70 and Euclidian distances (d) less than 1.50 (corresponding approximately to the 25th percentile) were considered a good match.

Five-cluster solution

Undercontrolled type. The percentage of individuals included in the first cluster was 16.7% of the participants, representing 174 cases. According to the two criteria we used to confirm the label for this scale only one profile fitted the required standard, namely the undercontrolled type from a three-cluster solution ($r = .83$, $d = .89$). However, the resulting profile can also be seen to be a mixture of high undercontrolled and low reserved - following Herzberg and Roth's (2006) five-cluster solution. From the Five Factor profile perspective it can be observed that the distinguishing elements for this cluster are E+ and C-.

Strain type. The second cluster includes 17.2% of the participants, a total of 179 persons. None of the existing literature-derived profiles meet the criteria to justify a claim of sufficiently close similarity with this cluster. The specific traits, on a Five-Factor personality model, indicate a prototype with disharmonic features: scores above the average for O, E, N and C, and scores below average (e.g.: $z < -0.50$) on the A scale.

Resilient type. Cluster three includes 21.4% of the participants representing 222 cases. The distinctive traits of these people are found in high scores on all five scales of the Big-Five model except for neuroticism. The label used to name this typology is consistent with previously described profiles (both with the resilient type in a three-cluster ($r = .84$, $d = .86$) and ($r = .81$, $d = 1.22$) with the resilient in a five-cluster typology). However this cluster is also rather similar to the confident (well-adjusted) type as proposed by Herzberg and Roth (2006) ($r = .72$, $d = .89$).

Overcontrolled type. Cluster four comprehends 22.3% cases, representing 232 participants. The only profile that fitted this type was the one for the overcontrolled type rendered in a three-cluster solution ($r = .74$, $d = .79$). The overcontrolled type obtained in a five-cluster solution (Herzberg & Roth, 2006) had the profile closest to this cluster, although at a lower degree of similarity than the required standards ($r = .52$, $d = 1.77$).

Passive type. The fifth cluster also accounts for 232 cases, representing 22.3% observations. No previously reported profile seems to fit this type well. However the closest profiles in terms of the two criteria mentioned above are the reserved type in Herzberg and Roth's (2006) five-cluster solution ($r = .44$, $d = 1.10$) and the resilient type in our literature-based three-cluster solution ($r = .45$, $d = 1.51$). On the other hand, this cluster could also be seen as an opposite type for the strain type ($r = -.97$, $d = 3.27$ these being the highest absolute values obtained from all possible paired comparisons). On a Five-Factor personality model, the prototype profile indicates high scores for A and low scores for dimensions N, E, and C.

From analysis of demographic data, we obtained significant statistical associations between our five prototypes and education level - $\chi^2 (16) = 77.84$, $p < .001$, urban vs. rural milieu - $\chi^2 (4) = 35.08$, $p < .001$, and the exact location of urban residence - $\chi^2 (4) = 19.52$, $p < .001$.

Analysis of standardized residuals to study the effect of education level shows that there is a higher presence of the resilient typology among university graduates and postgraduates, and a low presence of this type in the group comprised of those with only 10 years of education and those who have no education beyond the completion of vocational training school. The reverse of this situation can be found for the overcontrolled type; this is more frequent among those who have less than 12 years of education, by contrast with university graduates. Another interesting aspect is that among people who have a postgraduate degree (the highest form of education classified in our dataset) there is a relatively high frequency of the passive type and a relatively low frequency of the undercontrolled type.

Analysis of standardized residuals shows relatively higher percentages for the resilient and undercontrolled types in the urban milieu, as well as higher percentages for overcontrolled and strain type in the rural milieu. A supplementary analysis, focusing on the precise location of residence within the urban area, indicates a higher presence of the passive type in the centre of cities and a significant presence of the strain type in the suburbs of cities.

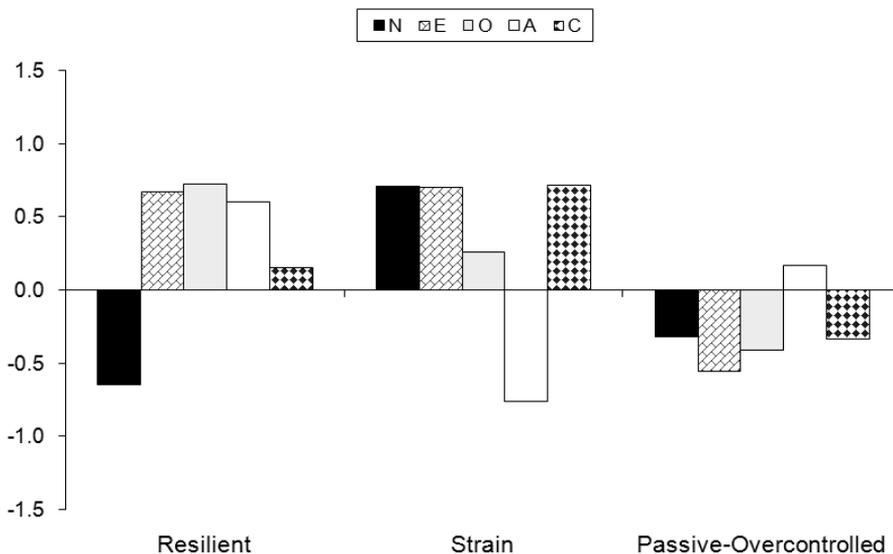


Figure 2.
Prototype expressed in z scores for the three identified personality types (N - Neuroticism; E - Extraversion; O - Openness; A - Agreeableness; C - Conscientiousness)

Three-cluster solution

Resilient type. From the profile analysis of the three-cluster solution, in the first group we may find the prototype corresponding to the resilient in the five-cluster classification. This cluster comprehends 29.6% of the participants (308 cases). The specific traits of these people involve high scores in E, A, O, average scores for C, and a low N score. This profile fits well with the literature-based profiles for a five-cluster solution; thus for resilient and confident types $r = .77$, $d = 1.37$, and $r = .78$, $d = .77$, respectively. This profile is also similar to the one described as the resilient type in the three-cluster literature-based solution ($r = .78$, $d = .81$). The psychological profile for this three-cluster type is similar to the resilient type presented in the five-cluster solution. Seen from a five-cluster solution viewpoint 96% of five-cluster resilient, 36% of five-cluster undercontrolled and 14% of five-cluster passives are individuals who, on a three-cluster solution, would be categorized as three-cluster resilient.

Strain type. The second cluster invites direct comparison with the strain type in the five-cluster classification, which included 332 participants (32.0% of those questioned). In this segment of the population we can observe that the prototype shows scores above the average for E, C and N, and below average for A. The psychological description is similar to that presented in the five-cluster solution for the strain type. None of the previous literature-based profiles satisfied the statistical criteria to justify a potential overlap with this cluster. From a structural perspective this cluster contains over 99% of the strain individuals, 41% of the undercontrolled and 32% of the overcontrolled type as identified in the five-cluster solution.

Passive-overcontrolled type. This cluster contains those individuals identified as of passive type falling within the overcontrolled category. This type comprehends 39.4% of the participants, totaling 399 cases. From the Five-Factor personality model perspective, this prototype shows scores below average for E and N, and slightly below average for O and C. The significance of this cluster can be better deduced from the composition of the group tested. On a five-cluster solution analysis, as described above, this heterogeneous type includes approximately 86% of the five-cluster passive types, and almost 67% of the members of the overcontrolled type, along with 23% of the undercontrolled type. None of the previous literature-based profiles fitted the standards to justify a potential overlap with this cluster.

An analysis of demographic data allows us to reach similar conclusions concerning the association of the three personality types with: (1) education level - $\chi^2 (8) = 45.17$, $p < .00$; (2) rural vs. urban milieu - $\chi^2 (2) = 22.77$, $p < .00$; and (3) exact location of residence - $\chi^2 (2) = 15.89$, $p < .00$.

We can observe a higher incidence of the resilient type among university graduates and a lower frequency of this type in the section of the sample with less

than a high school level of education. A higher percentage of the resilient type is to be found in the urban milieu and a higher percentage of the passive-overcontrolled and strain types in the rural milieu. As for the more precise location of residence in the urban area, the resilient type can be found more often in the central areas of cities, while the strain type appears more often in the suburbs.

Finally, in order to obtain a better description of the specific characteristics of each type discussed in this study and to see how well does the Block and Block's (1980) model can provide a meaningful interpretation for the resulted clusters, we mapped various personality types using a multidimensional scaling approach. More specifically, we have plotted on the same chart types derived from four different sources: (1) our five-cluster and three-cluster solutions (Ro5 and Ro3); (2) Herzberg and Roth's five-cluster solution obtained using a German, nationally representative sample (Ger5); (3) Avdeyeva and Church's first study (2005) that used NEO PI-R and provided a three-cluster solution to data from a non-western, Philippine sample (Phil3); (4) a literature based, three-cluster solution (Std3). This last was obtained by aggregating the findings from seven studies, including 11 different analyses involving a total of more than 5000 people, conducted in a variety of western countries by various researchers. The aggregated results were derived by averaging data presented in Herzberg and Roth's (2006) Table 1.

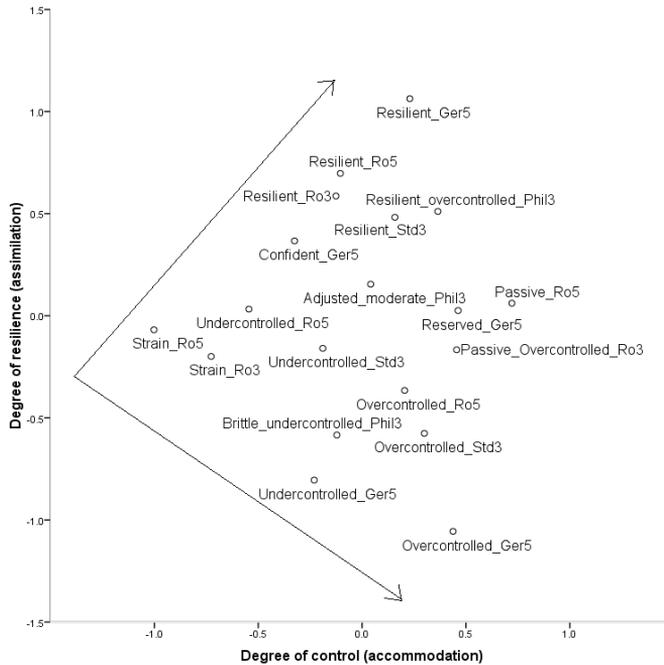


Figure 3.
A multidimensional scaling map containing several proposed prototypes

A visual inspection of how the various personality types plot on the map suggests two different possible classification systems: (1) one (inside arrows) reliant on a classical perspective that takes a U-shape perspective on personality types (Asendorpf et al., 2001), considering the levels of resilience (flexibility) (resilient type at the top) and of control (underecontrolled at the bottom left and overcontrolled at the bottom right) as the main axes along which to categorize various personality types, in accordance with Block and Block's (1980) theory; (2) one that adopts a complementary perspective which takes into account the degree of behavioral internalization (externalization) and the degree to which healthy psychological resourcefulness is available to allow for adaptive coping (for a discussion that links mental disorders to internalization, externalization, and personality, see Krueger 1999 or Krueger, McGue, & Iacono, 2001).

DISCUSSION

The objective of the first study was to identify the number of clusters and assign to them the most appropriate labels by which the Romanian adult population might be segmented, based on a typology derived in relation to the five-factor personality model that take into account the Block and Block's (1980) typology model. The results of the cluster analysis indicate two possible solutions: one with three and the other with five clusters. Both solutions have an acceptable level of stability, showing acceptable replicability under a double cross-validation procedure.

The five-cluster solution based on the five-factor personality replicates a series of personality types already well known in the research literature. This solution combines the five-factor model of personality with Block's typology: the undercontrolled type (with insufficient control of the impulses), the overcontrolled type (with excessive control of impulses) and the resilient type. However two additional types can be characterized, inviting further refinement in their definitions. For the present we have labeled them the strain type [comparable to Friedman's (1996) A type and to Block and Block's (1980) brittle undercontrolled type] and the passive type [somewhat similar to Friedman's (1996) B type and to Block and Block's (1980) resilient overcontrolled type]. The strain type was also found as more prone to possess irrational beliefs and maladaptive schemas that might trigger psychopathological problems (Sava, 2009). Another interesting finding is that these two newly distinguished clusters seem to be antagonistic. In addition there is no correspondence between our strain type and the remaining two types (confident and reserved) found in the German representative sample, but there is some correspondence between the passive types described in our study and Herzberg and Roth's reserved type (compared with their reserved type our passive type people are more reserved, less active, and relatively confident in their actions).

When comparing the two possible solutions provided in this study, it may be observed that our three-cluster solution reproduces two of our five clusters,

specifically the resilient and the strain types. The third cluster, which has been labeled the passive-overcontrolled type, seems in fact to be formed mainly as a combination of two clusters (the two independent types being the passive and the overcontrolled). Finally we should note that the undercontrolled type in a five-cluster solution cannot be simply mapped onto a three-cluster solution; membership of this type becomes partitioned in an almost equal way between the three types of the three-cluster solution when a reassignment is made. Even though the three-cluster solution seems to be the most favored solution for investigators using the Five-Factor model (Herzberg & Roth, 2006), we can observe a partial correspondence between our three-cluster types and the classical typology of Block (1995). Based on the results from this study it would be a fallacy of nomenclature to label, for instance, the passive-overcontrolled type as overcontrolled on the basis of its specific profile characteristics. So, while the resilient type is practically identical as a psychological profile with that seen in other studies and the strain type seems to be a particular subtype of the theoretical undercontrolled type, the passive-overcontrolled type is not similar to clusters described in other research, even though certain similarities and correspondences do exist.

From such a graphical representation as the one provided in Figure 3 we can appreciate the richness and the diversity of types assigned to the same class. For instance, we are able to notice at least three different undercontrolled subtypes: the strain type (N+, E+, A-), closer to the choleric temperament or to borderline personality disorder (self-regulating failure due to negative affect), the prototypical undercontrolled type (E+, C-), closer to the demonstrative, impulsive-hedonistic type and to histrionic personality disorder (self-regulating failure due to excessive reward seeking, immediate positive stimuli), and the undercontrolled type obtained in the German sample (N+, A-, C-), more similar to the antisocial personality (self-regulating failure due to inconsistent aims and lack of perseverance). It is worth noting that all three of these personality disorders belong to the B cluster according to the DSM IV classification (Widiger & Frances, 2002). Additionally, it can be seen that the three undercontrolled subtypes are plotted rather closed to each other, which implies they have a more similar profile than other types / subtypes of personality. This chart could also provide a clue that differences in the profile of various prototypes which were given an identical name actually represent various subtypes of a theoretical type, which have been obtained solely on statistical basis due to the characteristics of the samples which were analyzed. But most important, the chart suggest that we are dealing with fuzzy types and not with discrete types, due to several possible subtypes that might result due to variance in sample characteristics of various studies.

Unfortunately, a limitation of this analysis is that no independent measures of resiliency and control were included in the study; further research would therefore be needed to validate such a taxonomy that suggests that personality types based on the five-factor model of personality could be classified on their self-

regulation capabilities (degree of resilience and degree of control), as Gramzow et al. (2004) have suggested.

STUDY 2

The high level of heterogeneity found in the third cluster, the passive-overcontrolled type, might lead us to expect that to discard the five-cluster solution in favour of the three-cluster solution would result in a loss of valuable information about the behavior of the adult members of a specific type.

In order to verify in what manner a five-cluster solution may furnish additional information of practical relevance we carried out a second study, a non-experimental one, to test whether specific associations exist between the various identified types and certain self-reported behavioral preferences. This procedure was aimed at external validation of the cluster solutions in the first study. For instance, Caspi et al. (1997) found that undercontrolled people tend to engage more frequently in health-risky behaviors. Similarly, Atkins and Hart (2008) looking at data from a longitudinal project found that those who were identified as undercontrolled at 5 or 6 years of age were more likely than those resilient or overcontrolled to have sexual intercourse before the age of 16 and they were more likely to report they had hurt someone seriously at least once in the past year at the age of 12 (Atkins, 2007). Moreover, a significant inverse association was found between likelihood of childhood unintentional injury and the overcontrolled prototype score (Atkins and Matsuba, 2008), while children identified as resilient at 5 or 6 years of age were more likely than children characterized by the overcontrolled and undercontrolled personality types to volunteer 8 and 10 years later in adolescence (Atkins, Hart, & Donnelly, 2005). Finally, Vollrath, and Torgersen (2008) showed that types combining high extraversion and low constraint (a personality profile that is similar to the one for the undercontrolled type in our five cluster solution), engage in more risky health behaviors such as tobacco consumption or a higher number of new sexual partners. So, unless a shift of the analysis from the three-cluster solution to the five-cluster solution can be found to offer additional information related to the self-reported behaviors of the people surveyed we should consider the more parsimonious solution, the three-cluster one, to be better. On the other hand, if segmentation of the population into five psychological types could be shown to have a superior predictive value then that would provide support for the view that the five-cluster solution is to be preferred.

METHOD

Participants

Data used in the second study was collected from 150 participants in the course of a routine annual psychological examination that was obligatory for compliance with work safety legislation. After application of the screening procedures described in study one, 133 valid observations remained for analysis. The resulting sample comprised 94 males and 39 females, with ages between 18 and 59 ($M = 41$, $SD = 11.4$), classified according to three levels of education: those who had not completed high school (46%), those who had completed high school (45%), and those with university degrees (9%).

Instruments

Two sets of collected data are relevant: the DECAS Personality Inventory and the Bio-data. This latter refers to responses to seven questions examining self-reported behavioral aspects: (1) general state of health (alcohol and tobacco consumption, perception of state of health) and (2) childhood upbringing and general lifestyle (the strictness with which they were raised in childhood, the regularity of their practice of sport; exercise of voting rights; frequency of change of employment).

The bio-data was measured either nominally or ordinally (with only a few categories). For instance, in relation to smoking habits, the alternative answers to the question: "How many cigarettes do you usually smoke per day?" were a) none, I do not smoke b) up to 10 cigarettes per day; c) more than 10 cigarettes per day.

Procedure

The instruments were applied in groups of 15 to 25 participants. The remaining 133 valid cases were cluster analyzed directly by a k-means nonhierarchical method, using as cluster seeds the values found in our first study that had been conducted on a national representative sample.

Results

First, we checked whether the resulting clusters in the second study were similar to those obtained in the first study. We found support for the existence of a similarity between the profiles obtained in the first study and those observed in the second (e.g. the similarity between the strain type in the five-cluster solution obtained in the first study and the strain type for the five-cluster solution in the second study was .90 in terms of Euclidian distance dissimilarity and .83 in terms of profile similarity correlation). For all cases, the similarity between a specific type obtained in the first study and the corresponding type obtained in the second study met the acceptance criteria [Pearson correlations (r) between two profiles beyond .70 and Euclidian distances (d) less than 1.50], a result showing a good replicability of the types.

In order to see which of the two competing solutions is better in terms of external validity, in predicting various behaviors and attitudes, we used a non-parametric statistical method (χ^2 test of homogeneity), with a statistical power to detect small to average effect sizes for 133 participants (e.g., $w = .20$), ranging from 31 to 53, in most cases taking values between .40 and .50. In order to increase the statistical power of the analysis, we also took into consideration marginal results, having a $p < .10$.

Table 3.
Comparison of health, psychological and social status for various prototypes (values refer to percentages)

5 clusters	Resilient	Under-controlled	Over-controlled	Passive	Strain	χ^2	df	V	Residual analysis
Perceived health problems	9.1	15.0	36.0	8.6	25.7	8.75†	4	.25	O > P, R
Tobacco consumption	54.5	70.0	38.5	33.3	51.4	8.24†	4	.24	U > O, P
Alcohol consumption	18.2	20.0	23.1	16.7	27.8	1.46	4	.10	--
Regular (weekly) sport	41.7	23.8	22.2	24.3	33.3	2.50	4	.13	--
Strict upbringing	0.0	0.0	18.5	8.1	30.6	14.57**	4	.33	S > R, U
Exercise of voting rights	100.0	75.0	44.4	83.8	63.9	17.91**	4	.37	R, P > O
Number of past jobs (> 3)	16.7	42.1	11.1	8.3	11.1	15.77*	8	.24	U > R, P, O, S
Higher education degree	25.0	4.8	0.0	13.5	5.6	13.95†	8	.23	R > U, O, S
3 clusters	Resilient	Passive-overcontrolled	Strain	χ^2	df	V	Residual analysis		
Perceived health problems	12.5	22.5	22.2	1.45	2	.10	--		
Tobacco consumption	45.5	34.1	57.4	5.10†	2	.19	S > PO		
Alcohol consumption	15.2	19.5	27.3	1.95	2	.12	--		
Regular (weekly) sport	33.3	19.5	30.4	2.13	2	.12	--		
Strict upbringing	0.0	14.6	23.2	9.42**	2	.27	S > R		
Exercise of voting rights	77.1	75.6	62.5	2.98	2	.15	--		
Number of past jobs (> 3)	27.3	9.8	12.5	6.37	4	.15	--		
Higher education degree	13.9	9.8	3.6	3.57	4	.11	--		

** for $ps < .01$, * for $ps < .05$, and † for $ps < .10$

R – Resilient; S – Strained; PO – Passive-Overcontrolled; U – Undercontrolled; O – Overcontrolled; P – Passive

For illustrative purposes, the Cramer’s V values indicating various intensities for effect sizes are: $V = .10$ (small effect); $V = .30$ (medium effect); and $V = .50$ (strong effect) (Ferguson, 2009; Sava and Maricutoiu, 2007).

DISCUSSION

As shown in Table 3, the five-cluster prototype is a solution that allows more discrimination between self-reported behaviors than does the three-cluster solution. For example there is a higher frequency of smokers among the undercontrollers (45% smoke at least 10 cigarettes a day) than among other categories, particularly the passive type. The undercontrollers also tend to change employment more often than any other personality type, while the overcontrollers are more likely to perceive themselves as subject to frequent health problems than are the resilient and the passive types.

The strain category includes more people who agreed they were strictly raised as children, particularly when compared to the resilient and the undercontrolled types. Likewise, the resilient cluster contains a higher proportion who exercised their vote during the most recent elections as well as a higher percentage of people educated to university degree level.

The objective of the second study was to achieve external validation of the personality types identified in the first study. The data we obtained support the five-cluster, over against the three-cluster, solution. The five-cluster solution can be seen to provide better differentiation between the participants' behavior styles. For example, considering employment stability, only the five-cluster solution successfully highlights the fact that it is the undercontrolled type which manifests the highest degree of job instability.

It remains an admitted limitation of the results obtained in the second study that both the classification of participants into personality type and the criteria for classifying behavioral differences were based on self-report data.

GENERAL DISCUSSION

The purpose of the research reported in this paper is to validate, internally and externally, a typology of personality based on the dimensions of the five-factor model, measured in a large sample representative of the Romanian population. The results show that five types can be identified and this solution has been shown to have both external and internal validity.

The first three discussed types (resilient, overcontrolled and undercontrolled types) are consistent findings of research studies of personality typology based on the Big-Five model (Asendorpf & Van Aken, 1999; Barbaranelli, 2002; Block, 1995; de Fruyt, Mervielde, & van Leeuwen, 2002; Herzberg & Roth, 2006). However the only two studies conducted using nationally representative samples (the present study and Herzberg & Roth's 2006 study) converged on the view that a five-cluster solution may possibly furnish a better typology based on the five-factor personality model. One possible explanation for this is that when using

national representative samples which are more heterogeneous more clusters can emerge, reflecting the higher degree of type heterogeneity.

Fruyt, Mervielde, and van Leeuwen (2002) have argued, research in this area should aim to go beyond simple replication of the three major personality types described by Block (1995) and should try to identify new personality types, beyond those already described. Hertzberg and Roth (2006) were among the first authors to propose an extension of personality prototypes beyond the big-three types to include confident and reserved types also. In the present study we obtained two additional antagonistic types: the strain type and the passive type, where the later has some correspondence with the reserved type described by Herzberg and Roth (2006) and to a resilient subtype which was entitled - well adapted - found by Boehm, Asendorpf, and Avia (2002).

Based on psychological similarities between various profiles, as presented in figure 3, we may tentatively reply to a question raised by Avdeyeva and Church (2005) that is, whether resiliency and control are actually orthogonal dimensions as suggested by Block and Block (1980) or whether the relationship between resilience and control is in fact quadratic (e.g., optimal resiliency is associated with an optimal level of control) as has been argued by Asendorpf et al. (2001). It would appear that all types based on a five-factor personality model can be delineated by combining various degrees of control and resilience, treated as orthogonal dimensions. For instance, the reserved, the passive and the passive-overcontrolled types can be seen as exhibiting at different degrees of intensity the type described by Block and Block (1980) as resilient overcontrolled.

However we should also point out the real difficulties that exist in replicating any standard typology of personality that is based solely on cluster analysis. As Costa et al. (2002) have noted, the same familiar cluster names have been used in presentation of the results from various studies so as to conform to the nomenclature in reports of previous findings even though the Five-Factor personality profile pattern was not similar for the specific types being so labeled. A possible solution to this limitation is proposed by Herzberg and Roth (2006). They suggested that the cluster analysis should only be applied to representative population samples, as the initial step to extract the appropriate number of clusters in a given country. Then the next step would be to assign the participants to a specific type on the sole basis of population parameters (rather than on the basis of any new sample), using discriminant functions as a statistical method rather than cluster analysis. This approach is intended enhance cluster replicability and reduce the possibility of labeling error. However, regardless the cluster solution found in a study, it seems that all resulted personality types can be interpreted as a specific combination of the two self-regulation processes: the degree of resilience and the degree of control. In our case, the strain type shares some characteristics of the undercontrolled type, but the former has even a lower degree of resilience.

Similarly, the passive type shares many characteristics of the resilient prototype, but is less assertive and active.

A further point needs to be made concerning these two new clusters, namely the strain type and the passive type. These types seem to be novel, with no previous findings fitting the personality profiles associated with them. We are therefore left with a need to consider whether our finding of two novel types might be accounted for due to features peculiar to this study. The two features concerned are: the indigenous (DECAS) personality measure used and the specific Romanian cultural context. Since the DECAS personality inventory has been previously validated as an adequate measure for use in investigating the standard five-factor personality model, it is more likely to be the cultural context that is the source of the two previously unremarked clusters. In this regard, Adamesteanu (2008) affirmed that there are two types of Romania (the urban – forward-looking and culturally orientated to the West, which is modernized, and the rural – which is less developed, and more traditional and archaic). Post hoc analysis has revealed that a significantly higher percentage of people categorized as strain type live in a rural milieu (61%) and a similar tendency is seen in regard to the passive type. A contrasting situation has been found for the more commonly recognized clusters, in particular for the resilient type and for the undercontrolled type, of whom respectively 59% and 60% live in an urban milieu. Based on the above figures, it may be the case that these two novel types, which go beyond the Big-Three typology, manifest as a consequence of sensitivity of the prototype patterns to the cultural context.

Another limitation is related to our decision to conduct our analysis without taking into account the potential implications of gender differences that some previous findings (e.g., Pulkkinen, 1996) suggest may be significant. We based our decision on technical grounds, being primarily interested in ensuring an appropriate sample size to overcome most of the technical limitations that would have been involved had we run a cluster analysis on a smaller sample.

A possible additional limitation of the study is the decision to use an alternative instrument for the Big Five, one that may underestimate the type equivalence across cultures. However, when we compare our results with those obtained in the German population (Herzberg & Roth, 2006), we can see that we have replicated a five-cluster solution rather well. This resulted even though we employed a different means of operationalizing the five factor personality model as a strategy to increase the construct validity of these findings, in particular the finding that a five-cluster solution might be a better solution than a three-cluster solution when using nationally representative samples.

Another limitation is the decision to extract the clusters solely on the five global scores which affects the reliability of the results (Mandara, 2003). The use of another instrument such as the NEO PI-R (Costa & McCrae, 1992), which provides scores for facets in addition to the five global dimensions, might have offered a

better way to develop reliable clusters. However, in this research we found a very good replication of the five clusters obtained on a Romanian representative sample in the second study that was done on an independent sample consisting of 150 adults. This finding supports the suggestion made by Herzberg and Roth (2006) that in order to get replicable clusters in subsequent studies based on convenient samples, it is recommended to use as cluster seeds those values that represent population parameters resulted from a probabilistic representative sample.

In a similar vein, this paper provided limited opportunities for discussing the personality types derived from the Big Five model through the lenses of other theoretical approaches [see for instance Cloninger (1994); Thomas, Chess, & Birch (1970)]. For instance, the concept of novelty seeking proposed by Cloninger (1994) can be theoretically linked to the undercontrolled type, while harm avoidance seems to be a less developed trait among people perceived as resilient. Future studies should empirically explore the link between the five-factor model derived typology and other relevant theories regarding personality and temperament.

Despite these limitations, using personality types does have its utility in that the convenient labels used to summarize combinations of traits make sense to many practitioners as well as to naïve specialists working in human resources and in clinical contexts, even if such labels might have less predictive power than an approach using traits (Costa et al., 2002; Roth & von Collani, 2007). In an analogous way the four personality types proposed by Gough (1987, as cited in Pitariu et al., 2006) do not have as much predictive power as the California Personality Inventory's twenty folk scales on which those types are based. However, due to their practical utility, they have been widely accepted within the community of practitioners and are now routinely included in electronically generated reports. In short, despite the existence of some technical limitations in their use, personality types have proved user-friendly for the average consumer of psychological testing without surrendering too much of the predictive power which is to be found in a dimensional approach. Based on these practical considerations, we found it useful to look at different personality types on the basis of a five-factor personality model. The explanatory complexity and ecological validation of such an approach brings additional benefits, allowing us to move beyond a classical perspective that remains focused on the one-dimensional treatment of personality.

To summarize our main findings, we can conclude that a choice of five, rather than three, personality prototypes is more appropriate when seeking a personality typology based on the five-factor personality model. This finding is particularly relevant for studies where representative samples are used rather than for studies based on convenient medium- or small-sized samples. It is also the case that the five-cluster solution provides a better fit when care is taken to avoid the bias towards a smaller cluster number solution that some technical decisions can otherwise generate.

Beyond the question of how many prototypes it is better to extract, there is an additional issue related to labeling such types. It is not easy to make direct comparison of the findings of reported studies due to the variety of their cultural contexts, sampling procedures and sizes, instruments and types of research (e.g., self-reports). To this picture we must add concerns that have been voiced about the consistency of labeling of types. We may therefore feel that it is time to challenge the idea that there are just three universal types with well-established five factor personality profiles. Yet, as Block and Block's (1980) suggested, all prototypes seem to combine, with various degrees of intensity, two important axes: the degree of resilience / flexibility and the degree of control.

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