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Typeness of Personality Profiles: A Continuous Person-Centred Approach to Personality Data

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Abstract

I propose a new method of analysing personality profiles based on multiple traits. Personality profiles are regressed within individuals on prototypic profiles for personality types. To increase reliability, empirical Bayes estimates as obtained from hierarchical linear modelling (HLM) are used. The regression coefficients are interpreted as typeness, the extent to which the individual personality profile deviates from the mean profile in the sample consistent with the deviations of the personality types. These continuous parameters of typeness are subsequently used in between-person analyses. This method was applied to two studies of Big Five profiles that were related to prototypic profiles for overcontrollers and undercontrollers. The typeness parameters, if reliable, showed a longitudinal stability and an external validity similar to the Big Five scales. The merits and limits of the proposed approach for the description of, and prediction from, personality are discussed. Copyright © 2006 John Wiley & Sons, Ltd.

INTRODUCTION

Personality can be defined as 'the dynamic organization *within the individual* of those psychophysical systems that determine his unique adjustments to his environment' (Allport, 1937, p. 48, italics added). Thus, personality psychology is concerned with the description prediction and explanation of this within-person organization, or personality structure. An individual's personality structure can be studied within a trait perspective on personality (Allport, 1937; Funder, 1991): Psychologically meaningful characteristics on which individuals reliably differ (traits) are isolated, and an individual's personality is described by a profile of trait scores. This article explores the extent to which the

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idiographic information in the individual profiles can be characterized by a minimal set of continuous parameters that can be subsequently utilized in nomothetic predictions of personality correlates.

This work is an extension of earlier studies on personality types that are empirically derived through cluster analysis. In most of these studies, the Big Five dimensions of the five-factor model of personality description (John & Srivastava, 1999) served as a starting point of the type analysis. Each individual is described by a profile of five scores. These profiles are grouped by cluster analysis into relatively homogeneous clusters. Each cluster represents a personality type, and the average profile of the cluster members describes a personality prototype.

In an informal review of the early literature on personality types, Caspi (1998) concluded that the three personality types *resilients*, *overcontrollers*, and *undercontrollers* that were originally identified by Block and Block (1980) through Q-factor analysis of Q-sort judgments of children (see also Asendorpf & van Aken, 1999; Hart, Hofmann, Edelstein, & Keller, 1997; Robins, John, Caspi, Moffitt, & Stouthamer-Loeber, 1996), are also frequently detected in clustering studies of both children and adults, although the number of clusters varies across the studies. Asendorpf, Borkenau, Ostendorf, and van Aken (2001) tested this hypothesis empirically by applying a within-study replication criterion similar to the criterion used in Q-sort studies. In two studies of Big Five self-ratings in adulthood and one study of Big Five parental ratings of their children, Asendorpf et al. (2001) found that only three clusters were replicable. These types showed substantial consistency, not only across the three clustering studies but also with the Q-sort types derived by Asendorpf and van Aken (1999), and could once again be interpreted as resilients, overcontrollers, and undercontrollers.

In an attempt to study the generality of these three personality types, Asendorpf, Caspi, and Hofstee (2002) asked colleagues from Germany, Spain, Italy, Belgium, and the United States to apply the Asendorpf et al. (2001) approach to various Big Five data sets that referred to nonclinical samples in adulthood and adolescence. The results were mixed. The three types were found in the majority of seven studies, but only 6 out of 21 cross-study agreement coefficients surpassed the conventional criterion of $kappa = 0.60$ for sufficient agreement, and the cluster centres in two of the seven samples were clearly not consistent with resilients, overcontrollers, and undercontrollers. Thus, these types represent frequently found personality types but they are not necessarily the types that best describe personality differences in every sample.

Whereas personality description through profiles of trait scores is a routine procedure for describing individuals, particularly in applied settings, the utility of such profiles for the prediction of personality correlates is presently controversial. The routine variable-centred procedure is multiple regression that weighs scores on multiple trait dimensions for all individuals in the same way, such that the weighed sum maximally predicts a criterion variable (e.g. emotional or social adjustment, academic or job achievement). This approach ignores the individuals' personality structure.

Therefore, it has been repeatedly suggested to make better use of the 'idiographic' information on personality structure in 'nomothetic' predictions of personality correlates (Asendorpf, 2003; Asendorpf & van Aken, 1999; Asendorpf et al., 2001, 2002; Block, 1971; Caspi, 1998; York & John, 1992). One approach is to use information on differences between personality types for prediction. If only two personality types are distinguished, one dummy-coded variable (score 1 for membership in one type, score 0 otherwise) captures all information on differences between the two types, and can be used for

prediction through simple regression. If $k > 2$ types are distinguished, $k - 1$ dummy-coded variables capture all information on differences between the types, and can also be used for prediction through multiple regression (see e.g. Costa, Herbst, McCrae, Samuels, & Ozer, 2002).

This configural type approach preserves idiographic information on trait configurations in the definition of the types, and can utilize it for prediction. The main disadvantage of this approach is that it is only possible to reliably distinguish a few discrete types, and that most idiographic information is lost in the reduction of a profile of continuous trait scores to a yes-no distinction regarding the best-fitting type. Costa et al. (2002) and Asendorpf (2003) contrasted the predictive power of dummy-coded types with the predictive power of continuous variables for various Big Five questionnaire and Q-sort data sets and concluded that the variable-centred approach was clearly superior to the person-centred configural type approach in most cases.

It is tempting but unwarranted to dismiss person-centred approaches to personality data altogether on the basis of these findings. Dummy coding of types is only one very rough way of generating variables from person-centred data. Alternatively, interindividual differences in personality profiles can be described with continuous variables. If these variables preserve more of the information on within- and between-person differences than the dummy coding of discrete types, they may be more powerful predictors of personality correlates.

The central idea of the proposed new approach is to characterize personality profiles through their *typeness*, that is, through their *directional deviation* from the average profile in the sample. The direction of the deviation is the direction in which personality types identified in earlier research deviate from the average personality pattern. For example, the typeness of an individual for overcontrollers, the *overcontrolness*, is the extent to which the individual's personality profile shows a similar, but perhaps more extreme deviation from the average profile in the sample as a prototypical overcontroller.

Figure 1 illustrates this point. Hypothetical profiles of three individuals A, O and X (solid lines) are depicted, and the prototypic profile for an overcontroller (dotted line), all based on z-transformed ($M = 0$, $SD = 1$) Big Five scale scores (e.g. assessed with the NEO-PI or the NEO-FFI; Costa & McCrae, 1989). Individual A has average scores in the sample for all five scales. Individual O is characterized by high overcontrolness because it closely matches the (dotted) prototypic profile of an overcontroller, characterized by high N and low E. Individual X deviates from the sample mean even more than O, and in the same direction (extremely high N, extremely low E); thus, X is characterized by extremely high overcontrolness. This example highlights the fact that the proposed continuous measure of typeness is *not* a measure of similarity between an individual profile and a prototypic profile because X deviates from O as much as A deviates from O. Instead, it is a measure of the deviation from the mean profile in the sample consistent with the deviation of a personality type. The deviation of X is consistent with the deviation of O, but the deviation is more extreme.

Measuring typeness with intraindividual regression

Because the typeness of an individual profile is not a measure of similarity with a prototypic profile, it cannot be measured with similarity coefficients such as the Euclidean distance from a prototypic profile or the (intraclass) correlation with the prototypic profile. Instead, the *unstandardized* regression coefficient obtained from an *intra*individual

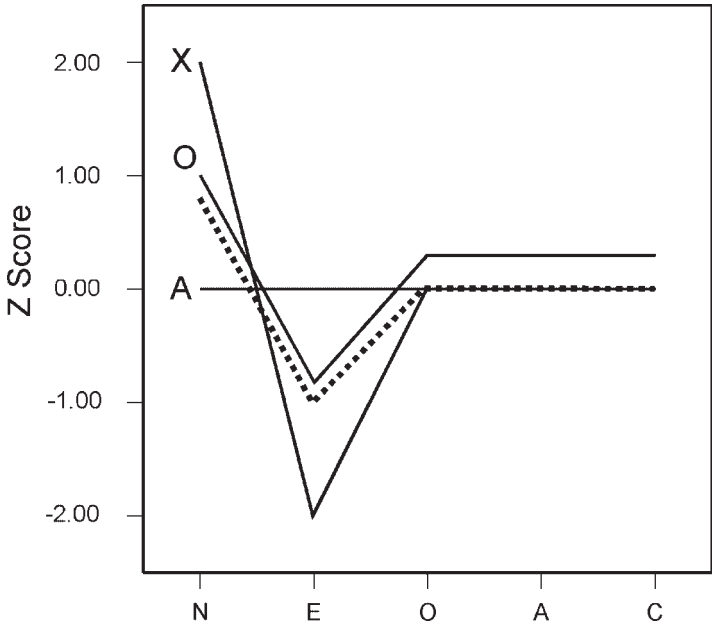

Figure 1. Hypothetical Big Five profiles for 3 individuals A, O, X (solid lines) and the prototypic profile of overcontrollers (dotted line) based on *z*-transformed scale scores (N = neuroticism, E = extraversion, O = openness, A = agreeableness, C = conscientiousness).

regression of the individual profile on the prototypic profile provides a measure of typeness. If the individual profile is identical with the prototypic profile, the unstandardized regression coefficient *b* is 1. If it is a profile that deviates more strongly from the average profile than the prototypic profile, *and in the same direction*, *b* is greater than 1. For profile X in Figure 1, *b* equals 2. If it deviates less strongly than the prototypic profile, but still in the same direction, *b* is positive and smaller than 1. If it deviates from the average profile in the opposite direction than the prototypic profile, *b* is negative. Continuing the example in Figure 1, for an individual with *z*-scores of −1 for N, 1 for E, and 0 for O, A, C, *b* equals −1.

It is important to note that this measure of profile deviation is only sensitive to profile shape, not to profile elevation. Thus, *b* equals 1 also for the profile of an individual that is 1 *SD* above or below the prototypic profile of an overcontroller for all the Big Five. Because profile elevation is often psychologically informative, it should be considered in addition to profile shape.

For multiple prototypic profiles, these considerations suggest the *intra*individual regression equation

$$\mathrm{Y} = b0 + b1^{*}(\mathrm{P1} - \mathrm{P0}) + b2^{*}(\mathrm{P2} - \mathrm{P0}) + \cdots + \mathrm{b}k^{*}(\mathrm{P}k - \mathrm{P0}) + error$$

where Y is the individual profile, b0 is the profile elevation, and the *bi* ($i = 1, \ldots, k$) are the unstandardized regression coefficients for the prototypic profiles P*i* that are centred around the mean profile in the sample P0 (the grand mean of all profiles). The *bi* characterize the shape of the individual profile Y, and can be interpreted as the typeness of the profile Y for the prototypic profile P*i*.[1]

[1]In the present application to Big Five profiles, the Y and P*i* are vectors with 5 elements that represent the Big Five scores of an individual, or the prototypic Big Five scores of a personality type.

Profile elevation for Big Five profiles

If we apply this approach to personality profiles based on Big Five scales or ratings, we have to make sure that the individual profile elevation is psychologically meaningful. It is not appropriate to standardize the individual profiles such that their elevation is zero for each individual, because such an ipsatization would remove potentially useful information about personality. Instead, all scales or ratings should be scored such that high scores are socially desirable. In this case, the mean profile elevation informs us about the overall desirability of the profile (which may be due to particularly desirable traits of the target individual, to social desirability tendencies of the judges of the target, to mood-induced optimistic/pessimistic biases, etc.). For example, the profile elevation of the NEO-FFI (Costa & McCrae, 1989) is not psychologically meaningful because high scores are desirable for four of the Big Five scales but not for the neuroticism scale. If the neuroticism scale is inverted into a scale assessing emotional stability, the elevations of the recoded profiles are meaningful.

Defining prototypic personality profiles

The parameters that characterize individual profiles with regard to personality types depend to some extent on the specifics of how the prototypic profiles are defined. Three main approaches to defining prototypic personality profiles can be distinguished.

In *empirical definitions*, personality types are derived through cluster analysis, and the resulting cluster centres define the prototypic profiles. The advantage of this approach is that the resulting profiles are defined such that they simultaneously maximize differences between the types and minimize the mean individual distance from the best-fitting type. The main disadvantage is that the resulting profiles depend on specifics of the assessment instrument and the sample of individuals, and thus show only moderate similarity across different studies.

In *a priori raw-score definitions*, the prototypic profiles are defined independently of specifics of the study in terms of profiles of raw scores. Typically, the empirical definition derived from an earlier, large-sample study is used as the *a priori* definition for later studies with the same instrument. This approach avoids the disadvantages of empirical definitions, but at the same time looses their advantages. The prototypic profiles are identical across different studies, but the choice of the prototypic profile may be less optimal for specific samples. For example, only few individual profiles may show a close fit to a type, and major differences between the individual profiles are not reflected in differences between the prototypic profiles.

A priori z-score definitions minimize the disadvantages of both approaches and make it possible to use identical prototypic profiles for different assessment instruments. Figure 2, Panel B, shows *a priori* definitions of prototypic profiles for overcontrollers and undercontrollers that were used in the present studies. They are based on the results by Asendorpf et al. (2001) (see Figure 2, Panel A) which confirmed the characterization of these three types by Caspi (1998), and on emotional stability scores (inverted neuroticism scores). A definition of a prototypic profile for resilients is not needed in this case because resilients are well characterized by profile elevation, not by profile shape (after inverting neuroticism; see Figure 1, Panel A). Therefore, typeness for resiliency would correlate highly with elevation which would not only introduce unnecessary redundancy in the profile descriptions but also pose collinearity problems for subsequent predictions of external variables from elevation and typeness.

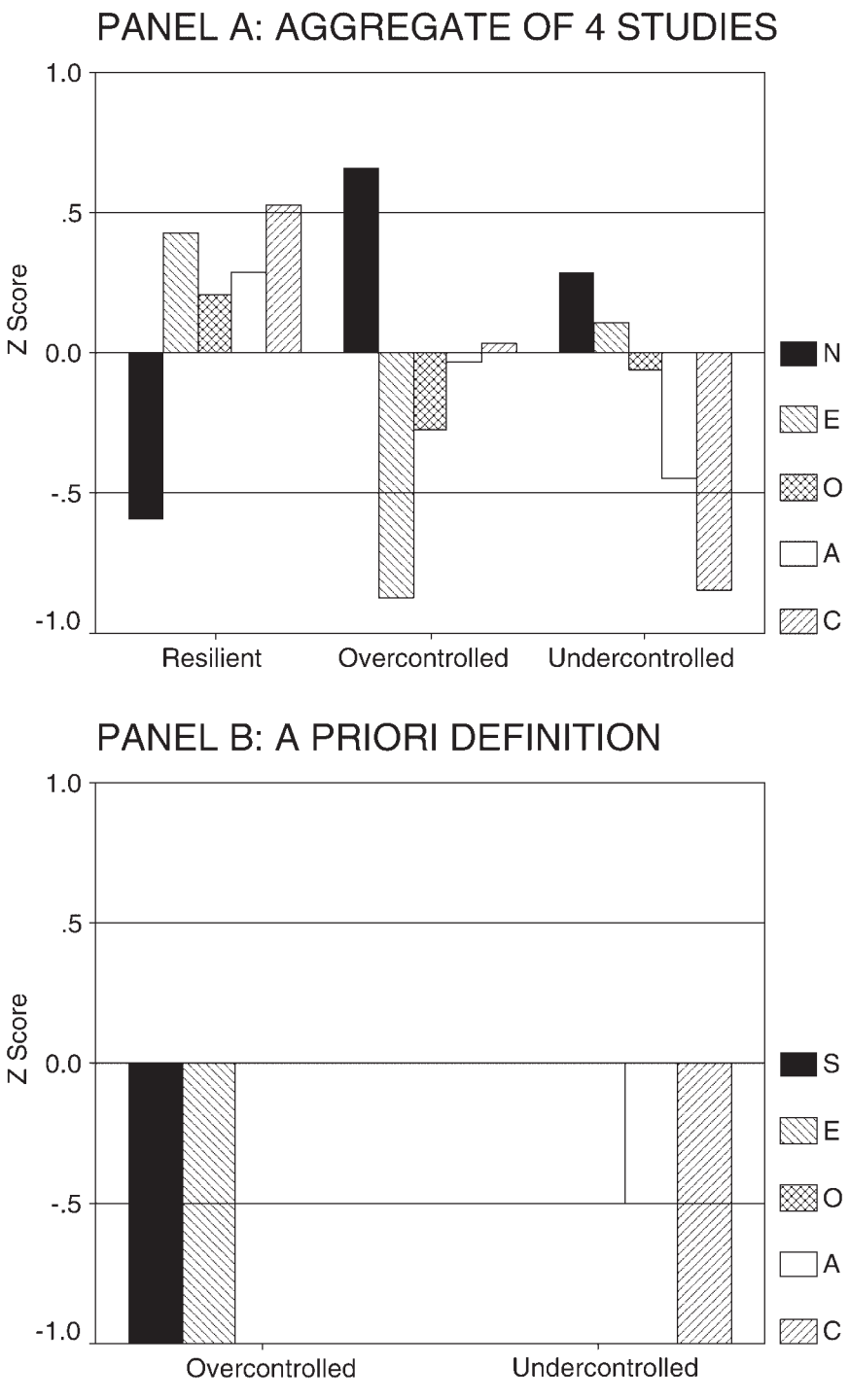

Figure 2. Aggregate of personality prototypes aggregated across four studies (Panel A, adapted from Asendorpf et al., 2001, Figure 2E) and *a priori* definition of over- and undercontrollers based on this result by two marker variables respectively (Panel B, with neuroticism N inverted to emotional stability S).

From these *z*-score profiles for overcontrollers and undercontrollers, raw score profiles are computed using the empirically determined means and standard deviations for each sample of interest. This mixed *a priori* and empirical approach makes sure that the *z*-score prototypic profiles are identical across different studies although between-study variations in the means and standard deviations are also taken into account.

For example, in applications of this approach to Big Five assessments of a sample of individuals, the prototypic profile of an overcontroller in Figure 2, Panel B, is transformed into a raw score prototypic profile, using for each of the 5 scales the transformation $y = SDz + M$, where z is the scale score in the prototypic *z*-score profile, *SD* is the observed standard deviation of the scale in the sample, and *M* is its observed mean in the sample.[2]

Estimating individual profile parameters

The three parameters elevation, overcontrolness and undercontrolness that characterize the individual Big Five profiles in the present approach can be estimated through ordinary least-squares (OLS) regression by computing unstandardized regression coefficients separately for each individual. Because these regressions are based on only few data points (five in the case of Big Five scores), and because many individuals are expected to show only low intraindividual variation in the Big Five scores ('flat' profiles), the resulting coefficients are not very reliable on average. Empirical Bayes (EB) estimation obtained from hierarchical linear modelling (HLM; Raudenbush & Bryk, 2002; for software see http://www.ssicentral.com/hlm/hlm.htm) offers an alternative way of estimation that takes the unreliability of the individual profiles into account. In a nutshell, EB estimates are OLS regression coefficients that are weighted with their intraindividual reliability. The better the fit is between the individual profile and the prototypic profile on which it is regressed, the more the EB estimates correspond to the OLS estimates. The lower the fit is, the more the EB estimates approach the sample mean of the estimates.

Despite providing EB estimates, the software HLM 5 and higher computes robust standard errors that relax assumptions about the distribution of the individual regression coefficients. In the person-centred step of the analysis (in HLM called level-1 analysis), the individual raw score profiles are regressed within individuals on the grand-mean centred prototypic raw score profiles for overcontrollers and undercontrollers. The individual parameters are estimated using EB estimates. Also, the interindividual variance, the mean intraindividual reliability, and the interindividual correlations of the estimates are computed. Finally, statistical tests are provided for the deviations of the EB estimates from zero and the significance of their variation across individuals. The latter is particularly important because, as will be shown in Study 2, the variation of a typeness coefficient may be not distinguishable from random variation and thus be not psychologically meaningful.

In most applications of HLM, the individual parameters resulting from the level-1 step are treated as dependent variables that are subsequently predicted in a variable-centred ('level-2') step by external variables such as age, socioeconomic status, personality etc. Such analyses do not fit into the present approach. Instead, the individual parameters are treated as independent variables that predict external variables in subsequent analyses, provided that the parameters show significant interindividual variance and sufficient intraindividual reliability. Thus, the present approach uses HLM only for estimating the

[2]A fourth possible approach, regressing individual *z*-transformed profiles on prototypic *z*-scored profiles, is less useful because differences between the means and standard deviations of the Big Five are lost. This information is irrelevant for the elevation parameter but seriously affects the regression slopes.

typeness scores and testing properties of their distribution in the sample, not for the subsequent variable-centred predictions of external variables.

To summarize, the present approach comprises three main steps: (a) converting *a priori* z-score profiles for personality types into raw score profiles, (b) estimating continuous profile elevation and typeness parameters in a person-centred step with HLM and (c) using the between-person variation in these profile parameters for predicting external variables in a variable-centred step. This approach was applied to existing data from two longitudinal studies, the Berlin Relationship Study and the LOGIC study.

BERLIN RELATIONSHIP STUDY

Data from the Berlin Relationship Study, a short-term longitudinal study on personality and social relationships, were re-analysed for the purpose of the present study. Because most methods have been described in detail by Asendorpf and Wilpers (1998), Asendorpf et al. (2001) and Asendorpf (2003), they are only briefly summarized here.

Method

Participants

The longitudinal sample consists of $N = 312$ first-year students (173 females, 139 males, age 19–24 years, $M = 20.3$) of Humboldt University, Berlin, who were followed from the second week of their first term for 18 months. The present study includes the initial assessment ($N = 312$) and follow-ups six months later ($N = 195$) and 18 months later ($N = 171$).

Measures of personality, self-esteem, and loneliness

The Big Five factors of personality were assessed by the German version of the NEO-FFI by Costa and McCrae (Borkenau & Ostendorf, 1993). Reliabilities and stabilities were highly similar to those reported by Asendorpf and Wilpers (1998). Global self-esteem as well as self-esteem towards same- and opposite-sex peers were assessed by German short versions of the SDQIII by Marsh and O'Neill (1984). The six items with the highest corrected item-scale correlations in the original questionnaire were selected and translated into German. The resulting 6-item scales showed satisfactory reliabilities ($\alpha = 0.79$). Loneliness was assessed by a short version of the UCLA loneliness scale. A German version of the UCLA scale (Döring & Bortz, 1993) was reduced to the five highest-loading items on the first factor, representing feelings of loneliness, and the five highest-loading items on the second factor, representing feelings of social isolation, in a non-orthogonal factor analysis of all 20 items in a representative sample of the general German population ($N = 592$). Because the two factors were highly correlated, only the 10-item aggregate was considered for analysis, and was highly reliable ($\alpha = 0.91$).

Measures of social relationships

The participants listed all persons that were currently personally important to them, indicated their sex and age and the duration of the relationship with them, and rated the quality of the relationship during the last 3 months on 8 Likert scales (see Asendorpf & Wilpers, 1998, for more details). In the present study, 5 scales were included that produced significant findings in the analysis by Asendorpf et al. (2001): *contact frequency* (6-point scale 0–5, 'less than once a month' — 'daily'), *closeness* of the relationship (5-point scale

1–5, 'very distant'—'very close'), *available support* (5-point scale 1–5, 'If I have problems, I would turn to this person to talk about my problems', 'never'—'always'), *frequency of conflict* (5-point scale 1–5, 'never'—'nearly at every encounter') and *in love* (5-point scale 1–5, 'not at all'—'very much so').

Results

Selectivity of the sample

As reported in detail by Asendorpf (2003), the variances of the NEO-FFI scales were not restricted in the first assessment, as compared with the German NEO-FFI normative sample by Borkenau and Ostendorf (1993). This was also true for the two follow-ups. Thus, there was no evidence for attenuated correlations due to biased sampling.

HLM analyses

Individual parameters were estimated using HLM 5.04 (Raudenbush, Bryk, & Congdon, 2001) (see Appendix for a technical description). At the individual level (level-1 of the model), each individual's Big Five profile Y was regressed on the prototypic overcontrol profile and the prototypic undercontrol profile (see Figure 1, Panel B), which were transformed into raw scores. Thereby, three continuous parameters were obtained for each individual in the sample, the intercept and the two typeness coefficients (the unstandardized regression coefficients $b1$, $b2$ for overcontrollers and undercontrollers). The intercept measures the individual profile elevation only if the prototypic profiles are centred around the grand mean. Therefore it is essential to centre the prototypic profiles this way.

HLM computes both ordinary least square (OLS) estimates (coefficients that result from ordinary multiple regression within each individual) and empirical Bayes (EB) estimates for these three parameters (EB estimates weigh the OLS estimates with their intra-individual reliability; see introductory section). At the sample level (level 2 of the model), HLM estimates the sample means, standard deviations and the mean intra-individual reliability of the three individual parameters, and provides t and chi^2 tests for the significance of the sample mean and variance of the parameters.

Table 1 indicates that the mean elevation of the 312 individual Big Five profiles was 3.51, with a significant variance component of 0.044. Individuals' mean overcontrol score was 0.25, with a significant variance component of 0.251, and their mean undercontrol score was 0.28, with a significant variance component of 0.528. The information on the sample means is not important for subsequent analyses because the means are irrelevant for the prediction of external variables.

What is important is the size of the variance components and their significance. Large interindividual variance is a necessary (though not sufficient) condition for high reliability and successful predictions of external variables; nonsignificant parameters are unlikely to be sufficiently reliable and valid. Table 1 indicates that all three parameters were significant, that is, true variation could be reliably distinguished from random variation, and that the mean intra-individual reliabilities were of medium size and similar for the three parameters. Because of the only moderate reliabilities, the EB estimates showed a much lower interindividual variance than the OLS estimates, 0.15 versus 0.30 (elevation), 0.29 versus 0.59 (overcontrolness), and 0.41 versus 0.90 (undercontrolness).

The EB estimates showed low to moderate intercorrelations (see Table 1) which is a requirement for their discriminant validity. Also, the two typeness coefficients were negatively correlated such that individuals with both high overcontrolness and high

Table 1. HLM results for the initial assessment in the Berlin Relationship Study

Fixed effect	Coefficient	*M*	*SE*	*t*(311)	*p*
Elevation	G00	3.51	0.02	204.74	0.001
Overcontrolness	G01	0.25	0.04	6.02	0.001
Undercontrolness	G02	0.28	0.06	4.64	0.001
				r	
Random effect	Coefficient	ρ	σ^2	U1	U2
Elevation	U0	0.48	0.044***	−0.51***	−0.19***
Overcontrolness	U1	0.47	0.251***		−0.53***
Undercontrolness	U2	0.45	0.528***		
Error at individual level	R		0.239		

$N = 312$. ρ refers to the estimated mean reliability of the individual estimates. σ^2 refers to the estimated variance components of the random error terms which were tested for significance with χ^2 tests. *r* refers to the intercorrelations of the EB estimates of U0, U1, U2. All results are based on robust standard errors.
***$p < 0.001$.

undercontrolness were rare. In fact, none of the 312 individuals had typeness scores more than 1 *SD* above average for both overcontrolness and undercontrolness. Together, the person-centred step of the analysis provided satisfactory individual parameters for the subsequent between-person analyses.[3]

Concurrent predictions of personality and relationships

From the EB estimates of elevation and typeness, the same personality and relationship variables were predicted that were analyzed by Asendorpf (2003). Therefore, the predictive power of the present approach can be directly compared with Asendorpf's findings for Big Five scales and discrete types.

The results for personality variables are presented in Table 2. The first column contains the percentages of variance explained by the NEO-FFI scales through ordinary multiple

Table 2. Head-to-head comparison of NEO-FFI scales, NEO-FFI profile parameters and dummy-coded types in the concurrent prediction of personality in the Berlin Relationship Study

	NEO-FFI	NEO-FFI profile parameters				3 types
	5 scales R^2	Elevation β	Overcontrolness β	Undercontrolness β	All R^2	dummy-coded[a] R^2
Shyness	0.39***	−0.34***	0.28***	−0.16*	0.34***	0.13***
Sociability	0.55***	0.56***	0.14	0.48***	0.31***	0.09***
Loneliness	0.30***	−0.38***	0.23**	−0.06	0.29***	0.20***
Self-esteem						
Global	0.50***	0.36***	−0.46***	−0.21***	0.49***	0.29***
With same-sex peers	0.23***	0.47***	0.08	0.29***	0.20***	0.08***
With opposite-sex peers	0.17***	0.28***	−0.10	0.20*	0.16***	0.04***
Average	0.36				0.30	0.14

$N = 312$.
[a]Two dummy variables; the third dummy-coded type is redundant with the others.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

[3]HLM also provides results in terms of OLS estimates. They were highly similar to those reported in Table 1, and the OLS and EB estimates correlated above 0.95 in each case.

regression; this column is identical with Column 5 in Asendorpf (2003, Table 1). The last column contains the percentages of variance explained by the three dummy-coded types. These data vary slightly from Column 2 in Asendorpf (2003) because the present analysis was based on the *a priori* prototypic profiles depicted in Figure 1, Panel B, whereas the analyses in Asendorpf (2003) were based on empirically derived profiles. The average percentage of variance explained in the six personality variables was 14% for both approaches.

The second-last column in Table 2 indicates that the three profile parameters (elevation and typeness for overcontrol and undercontrol) explained nearly as much variance as the 5 NEO-FFI scales (30% vs. 36% on average). Thus, the information loss through the reduction of the Big Five scales to the 3 profile parameters decreased the predictive power only slightly. In contrast, the continuous profile parameters showed much more predictive power than the differences between the 3 discrete types in each instance despite the fact that they were based on the same types (30% vs. 14% explained variance on average).

Table 3 presents similar findings for the prediction of social relationships. Although the overall predictive power was much smaller in this case, the overall power for the three profile parameters, 7%, was similar to the overall power of the NEO-FFI scales, 8%, and clearly greater than the overall power of the type differences, 4%. Only in one case (predictions of being in love with peers) were the predictions from the continuous variables nonsignificant and smaller than the predictions from the type differences. Given the many statistical tests and the very small effect sizes, I attribute this atypical result to chance.

Tables 2 and 3 also provide information on the interpretation of the three profile parameters. Considering profile elevation, it should be noted that this variable combines the effects of a desirable personality of the rated target person, socially desirable responding of the rater (the same person in the present case of self-ratings) and optimistic versus pessimistic biases of the rater, as induced by daily mood. Because the parameters for overcontrol and undercontrol are statistically controlled for these effects, they can be interpreted with some confidence as effects of trait configuration rather than global rating biases. Overcontrolness was associated with shyness, loneliness, lack of

Table 3. Head-to-head comparison of NEO-FFI scales, NEO-FFI profile parameters and dummy-coded types in the concurrent prediction of social relationships in the Berlin Relationship Study (results of multiple regressions)

	NEO-FFI	NEO-FFI profile parameters				3 types
Predicted variables	5 scales R^2	Elevation β	Overcontrolness β	Undercontrolness β	All R^2	dummy-coded[a] R^2
No. social relationships	0.09***	0.23**	0.11	0.31***	0.07***	0.02*
No. peer relationships	0.12***	0.12	−0.12	0.20*	0.10***	0.04**
Age of relationship partners	0.12***	−0.01	0.14	−0.23**	0.11***	0.03*
Duration of relationships	0.07***	0.02	0.04	−0.23**	0.07***	0.03*
Frequency of conflict	0.11***	−0.18*	0.08	0.19*	0.09***	0.05***
Closeness to mother	0.06***	0.29***	0.22*	0.06	0.05**	0.04**
Available support from father	0.07***	0.20*	−0.03	0.01	0.05**	0.06***
Contact frequency with peers	0.10***	−0.13	−0.43***	−0.13	0.10***	0.04***
In love with peers	0.01	0.03	−0.10	−0.07	0.01	0.02*
Average	0.08				0.07	0.04

$N = 312$.

[a]Two dummy variables; the third dummy-coded type is redundant with the others.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Table 4. Stability of NEO-FFI scales, NEO-FFI profile parameters and dummy-coded types

	Stability *r* over	
	6 months $n = 195$	18 months $n = 171$
NEO-FFI scales, average[a]	0.83	0.74
NEO-FFI profile parameters		
Elevation	0.80	0.69
Overcontrolness	0.84	0.77
Undercontrolness	0.84	0.73
Average[a]	0.82	0.73
3 types dummy-coded[a,b]	0.73	0.54

[a]Computed using Fisher's *r*-to-*Z* transformation.
[b]Two dummy variables; the third dummy-coded type is redundant with the others.

global self-esteem, low contact frequency with peers and closeness to mother; whereas, undercontrolness was associated with sociability and lack of shyness, low general but high peer self-esteem, many social relationships of short duration with young persons and more interpersonal conflict.

Longitudinal stability of the profile parameters

Table 4 contrasts the longitudinal stability of the profile parameters with the stability of the NEO-FFI scales and the dummy-coded types. The profile parameters showed virtually the same level of stability over 6 and 18 months as the NEO-FFI scales, whereas the stabilities of the dummy-coded types were lower. That the 6-month stability was 0.80 or higher for all three profile parameters suggests a good retest reliability for shorter retest intervals as well.

Profile parameters versus factor scores

In earlier discussions of the meaning of the three profile parameters, some colleagues have suggested that these parameters may closely resemble the first 3 unrotated factors of Big Five questionnaires. To test this hypothesis, the first and second assessment of the NEO-FFI were subjected to a principal components analysis with a forced 3-factor solution. The three factors of the first assessment explained 27.9% of the variance. The first factor correlated −0.94 with elevation, the second factor correlated 0.76 with overcontrolness, but the third factor correlated only 0.22 with undercontrolness. Although these correlations were significant, they were only high for the first two factors.

Another question is to which extent the three Big Five factors can be explained by the three profile parameters, and *vice versa*. Multiple regressions showed that each variable was explained well, $R^2 > 0.86$ in each case. Thus, the multivariate space defined by the first 3 Big Five factors was similar to the space defined by the profile parameters. This is not surprising because both the factors and the profile parameters were extracted from the same data.

An analysis of the stability of the three factors between the first two assessments showed a mean 6-month stability of 0.71 for the three factors (computed using Fisher's *r*-to-*Z* transformation). This stability was lower than the mean stability of the profile parameters (0.82, see Table 4), and even slightly below the stability of the dummy-coded types (0.73, see Table 4). Thus, the person-centred approach produced variables for the between-person

analyses that were different from, and more stable than, the first three factors of the NEO-FFI. An additional analysis for the rotated three factors, using varimax rotation, yielded generally lower correlations with the profile parameters, and a mean stability of only 0.67.

Discussion

This study successfully applied the proposed new method to NEO-FFI profiles amongst young adults. The resulting profile parameters showed significant interindividual variation, sufficient individual reliability and sufficient discriminant validity (their intercorrelations were low to moderate). Also, they showed a sufficient retest reliability (above 0.80 over 6 months in each case), and a long-term stability over 18 months that was not much lower than the retest reliability. Moreover, these retest results were highly similar than those for the 5 NEO-FFI scales on which the profiles were based.

Whereas the profile elevation was highly similar to the inverted first unrotated factor of the NEO-FFI, neither overcontrolness nor undercontrolness closely corresponded to the next two unrotated factors; for the rotated factors, the correspondence was even worse. However, multiple regressions showed that the three profile parameters predicted the three factors well and *vice versa*. Thus, the multivariate space generated by each set of variables was similar.

The longitudinal stability of the three profile parameters was higher than the longitudinal stability of the factors. This finding may come as a surprise to those who believe in the particular reliability of factor scores. The superior stability of the individual profile parameters may be attributed at least partly to the fact that they refer to constant prototypic profiles, whereas factors are completely independently derived for each assessment. The constancy of the *a priori* defined prototypic profiles does not only increase the temporal stability of the individual profile parameters, it may also increase the cross-study replicability of the nomological network around each parameter.

Concerning such a pattern of external correlates, profile elevation was related in this student sample to sociability, social and global self-esteem, and absence of loneliness and shyness regarding social relationships, elevation was related to the overall size of one's social network of relationships, felt closeness to one's mother, availability of support from one's father, and the absence of interpersonal conflict in relationships. Overcontrolness was related to low global (but not low social) self-esteem, shyness and loneliness, and to low contact frequency with peers and felt closeness to one's mother. Undercontrolness was related to sociability, low shyness and positive social self-esteem, but also to low negative global self-esteem; and to the overall size of the social network, to the number of peer relationships, to relationships of short duration and with young persons and to interpersonal conflict. Together, these patterns of concurrent correlates are consistent with the general view that overcontrol is related to internalizing tendencies, and undercontrol to externalizing tendencies (see Asendorpf et al., 2001, 2002; Caspi, 1998).

The external validity of the three profile parameters in terms of overall predictive power in multiple regressions was only slightly lower than the external validity of the 5 NEO-FFI scales. Again, this may come as a surprise because in multiple regressions, five variables have *a priori* a higher predictive power than three variables (see Asendorpf, 2003, for a discussion of fair comparisons between sets of predictors with different numbers of predictors). Also, the predictive power of the three continuous profile parameters was approximately twice as high (in terms of the explained variance) as the predictive power of

the 3 dummy-coded types on which they were based. This finding clearly shows that the prediction problem with discrete types identified by Costa et al. (2002) and Asendorpf (2003) can be attributed to the coarse scaling of interindividual differences in discrete type approaches, not to the person-centred perspective on personality underlying discrete types.

LOGIC STUDY

Data from the Munich Longitudinal Study of Individual Competencies (LOGIC), a longitudinal study on personality and cognitive competencies, were reanalysed for the purpose of the present study. Included are Big Five judgments provided by the participants themselves and a parent at ages 12 and 17, and concurrent assessments of personality, IQ, self-esteem and loneliness. Because most methods have been described in detail by Asendorpf and van Aken (1999, 2003a,b), they are only briefly summarized here.

Method

Participants

The participants were part of the Munich Longitudinal Study on the Genesis of Individual Competencies (LOGIC). The LOGIC sample originally consisted of 230 children (119 boys, 111 girls) who studied every year from their first or second year in preschool until age 12. The sample was rather unbiased because the schools were selected from a broad spectrum of neighbourhoods, more than 90% of the parents who were asked for permission gave their consent for their child's participation, and attrition until age 12 was low (19% over 8 years) and unsystematic (see Weinert & Schneider, 1999, for this initial part of the study). After age 12, the LOGIC sample was reassessed at age 17. Attrition was again low (6% over 5 years), resulting in 174 participants at age 17. A comparison with the 56 drop-outs did not reveal significant differences in terms of socioeconomic status of the family, or with ego-control or ego-resiliency that were assessed in the first year through a teacher Q-sort (see Asendorpf & van Aken, 1999).

Measures of the Big Five

At ages 12 and 17, the LOGIC participants were judged by themselves and their main caregiver (nearly always the mother) on 40 age-appropriate bipolar adjective pairs that assessed each factor of the five-factor model of personality with eight items (*extraversion*, *emotional stability*, *conscientiousness*, *agreeableness*, *culture*). The items were derived from the highest-loading items on the first five factors of a pool of 179 bipolar adjective pairs by Ostendorf (1990) in a multi-step procedure (see Asendorpf & van Aken, 1999, for details). The items were answered on a 5-point response scale (with labels *very*, *somewhat*, *neither/nor*, *somewhat*, *very*). The reliabilities of the scales were satisfactory for the parental judgements (age 12, median $\alpha = 0.86$, range 0.83–0.91; age 17, median $\alpha = 0.87$, range 0.84–0.93) and for the self-judgements at age 17 (median $\alpha = 0.82$, range 0.75–0.88). The self-judgements at age 12 showed sufficient reliability (median $\alpha = 0.76$) with the exception of the scales for emotional stability and culture ($\alpha = 0.68$ in both cases), which can be attributed to the young age of the respondents.

The parents also answered a questionnaire that included 4-item scales assessing *aggressiveness*, *shyness* and *sociability*. The items of the three scales were randomly mixed with other items and answered on a 7-point response scale. The reliabilities of the scales were satisfactory (median $\alpha = 0.85$, range 0.78–0.88).

IQ Measures

Verbal intelligence was assessed at age 12 with the German version of the Wechsler scales for school-aged children (HAWIK-R; Tewes, 1983), and at age 17 with the vocabulary subtest of the German version of the Wechsler scales for adults (HAWIE-R; Tewes, 1991). Nonverbal intelligence was assessed with the German version of the Culture Fair Intelligence Test (CFT-20; Weiß, 1987) at both ages. The internal consistencies of the verbal and nonverbal IQ variables were satisfactory ($\alpha > 0.82$). The two IQ-scores for each age were averaged, resulting in a total IQ score.

Measures of self-esteem and perceived social support

At age 12, *global self-worth*, self-perceived *peer acceptance* and self-perceived *scholastic competence* were assessed by German adaptations of the corresponding scales from Harter's (1985) Self-Perception Profile for Children. In addition, *loneliness* was assessed with a short version of a loneliness scale for children by Asher, Hymel and Renshaw (1984); see Asendorpf and van Aken (2003b) for details. All four scales showed satisfactory internal consistencies ($\alpha > 0.77$).

At age 17, *global self-worth*, self-perceived *peer acceptance* and self-perceived *scholastic competence* were assessed with German short versions of the corresponding scales of the SDQ III by Marsh and O'Neill (1984). *Loneliness* was assessed with a short version of the German adaptation of the UCLA loneliness scale; see Asendorpf and van Aken (2003b) for details. All four scales showed satisfactory internal consistencies ($\alpha > 0.79$).

Results

HLM analyses

Individual profile parameters were estimated exactly as for the Berlin Relationship Study, using the same definition of the prototypic personality profiles (see Figure 1, Panel B); the z scores were converted into raw Big Five scores separately for the four assessments (self- and parental judgements, ages 12 and 17). Table 5 indicates that the variance components for overcontrolness were nonsignificant for both types of judgments and both ages which seems to be the main reason for the insufficient reliability of overcontrolness. Inspection of the intercorrelations of the EB estimates showed that overcontrolness correlated -0.77 or even more negatively with both

Table 5. HLM estimates of the reliability and the variance components of the Big Five profile parameters for the four assessments in the LOGIC study

	Self-judgements				Parental judgements			
	Age 12, $n = 186$		Age 17, $n = 174$		Age 12, $n = 155$		Age 17, $n = 146$	
Random effect	ρ	σ^2	ρ	σ^2	ρ	σ^2	ρ	σ^2
Elevation	0.73	0.08***	0.68	0.08***	0.69	0.11***	0.74	0.15***
Overcontrolness	0.19	0.12	0.12	0.10	0.17	0.06	0.19	0.08
Undercontrolness	0.47	0.19***	0.52	0.18***	0.51	0.21***	0.41	0.14***

ρ refers to the estimated mean reliability of the individual estimates. σ^2 refers to the estimated variance components of the random error terms which were tested for significance with χ^2 tests. All results are based on robust standard errors.

***$p < 0.001$.

elevation and undercontrolness. Such collinearity poses serious problems for multiple regressions on the three parameters.

Therefore, the analyses were repeated with overcontrolness as a fixed effect only (no interindividual differences). The resulting HLM estimates for elevation and undercontrolness in this restricted model were highly similar to those reported for the full model in Table 5. In particular, the variance components σ^2 were significant, and the reliabilities ρ were sufficiently high in all four cases. Therefore, the following analyses are based on the restricted model.

Concurrent predictions of personality

Table 6 presents the results for multiple regressions of major personality variables at age 12 on the Big Five, the two profile parameters and the 3 dummy-coded types for both self- and parental judgements. As one might expect, the predictions were much stronger when the predictors and the criteria were reported by the same judges. A notable exception was self-rated scholastic competence which was as strongly predicted by the Big Five self-judgements as by the Big Five parental judgements. The reason seems to be that both types of judges based their judgements on the same information, namely school grades.

Undercontrolness showed a surprisingly benign pattern of external correlates in this study, for example positive correlations with IQ for both self- and parental judgements at age 12, and nonsignificant correlations with aggressiveness even for the same judges. This result should be interpreted with great caution because overcontrolness was missing in these predictions.

Overall, the profile parameters predicted the external personality variables more strongly than the types, but much less strongly than the Big Five scales. This result clearly differs from the result for the Berlin Relationship Study, where the profile parameters fared only slightly less well than the Big Five. Obviously this was due to the fact that overcontrolness was unreliable and had to be omitted from the analyses.

The same analyses for age 17 yielded similar findings (a table analogous to Table 6 can be obtained from the author). Again, the Big Five fared much better than the profile parameters (0.20 vs. 0.12 for self-judgements, 0.22 vs. 0.09 for parental judgements).

Longitudinal stability of the profile parameters

Table 7 presents the five-year stabilities of the Big Five scales, the profile parameters and the dummy-coded types. As in the Berlin Relationship Study, the profile parameters showed a stability similar to the Big Five, and a much higher stability than the dummy-coded types. In the case of the self-judgments, the mean stability of the Big Five was unusually low due to a stability below 0.25 for emotional stability and culture. The relatively low stability of the elevation parameter for the self-judgements and particularly low correlations (below 0.20) between the self-judgement and parental judgement of emotional stability and culture at age 17 suggest that this instability may be due to factors that influenced elevation and the emotional stability and culture self-judgements at age 17, for example stronger social desirability biases or higher susceptibility to mood effects at age 17.

Discussion

In this application of the proposed new method to Big Five self- and parental judgements in (early) adolescence, the results were mixed because one of the three parameters, overcontrolness, did not show sufficient interindividual variation and reliability.

Table 6. Head-to-head comparison of Big Five scales, Big Five profile parameters and dummy-coded types in the prediction of external correlates of personality in the LOGIC study at age 12 (results of multiple regressions)

	Self-judgements					Parental judgements				
Predicted variables	Big Five R^2	Elevation β	Undercontrolness β	Both R^2	3 types[a] R^2	Big Five R^2	Elevation β	Undercontrolness β	Both R^2	3 types[a] R^2
Aggressiveness[b]	0.11**	−0.08	0.13	0.03	0.02	0.31***	−0.26***	0.15	0.12***	0.06*
Shyness[b]	0.18***	−0.27***	−0.31***	0.16***	0.09***	0.37***	−0.35***	−0.45***	0.23***	0.19***
Sociability[b]	0.16***	0.27***	0.12	0.08***	0.09***	0.44***	0.42***	0.27***	0.18***	0.23***
IQ	0.20***	−0.08	0.18*	0.04*	0.02	0.27***	0.21*	0.17*	0.05*	0.01
Loneliness[c]	0.16***	−0.29***	−0.15*	0.10***	0.07**	0.06	−0.05	−0.01	0.00	0.02
Self-esteem[c]										
Global	0.12***	0.22**	0.22**	0.09***	0.06**	0.03	0.16	0.06	0.02	0.02
Peer acceptance	0.24***	0.37***	0.26***	0.19***	0.11***	0.09*	0.23**	0.16	0.06*	0.04*
Scholastic competence	0.17***	0.18*	0.09	0.04*	0.04*	0.17***	0.13	0.02	0.02	0.01
Average	0.17			0.09	0.06	0.18			0.09	0.07

Note: $n = 186$ for self-judgments and IQ, $n = 155$ for parental judgements.

[a]Two dummy variables; the third dummy-coded type is redundant with the others.

[b]Parental judgements.

[c]Self-judgements.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Table 7. Stability of Big Five scales, Big Five profile parameters and dummy-coded types over 5 years in the LOGIC study

	Stability *r*	
	Self-judgements $n = 174$	Parental judgements $n = 132$
Big Five, average[a]	0.39***	0.57***
Big Five profile parameters		
Elevation	0.36***	0.57***
Undercontrolness	0.52***	0.57***
Average[a]	0.44***	0.57***
3 types dummy-coded[a,b]	0.22**	0.32***

[a]Computed using Fisher's *r*-to-*Z* transformation.
[b]Two dummy variables; the third dummy-coded type is redundant with the others.
$^{**}p < 0.01$; $^{***}p < 0.001$.

Consequently, the overall predictive power of the remaining two profile parameters, elevation and undercontrolness, was much lower than the predictive power of the Big Five scales themselves. The 5-year stability of the two profile parameters was satisfactory, and for the self-ratings even somewhat higher than the 5-year stability of the Big Five scales on average which was due to a particularly low stability of the self-ratings of emotional stability and culture.

The problem with the overcontrol parameter in this study cannot be attributed to a general problem with the emotional stability scale because this scale was sufficiently internally consistent and showed an adequate 5-year stability for the parental judgements. Furthermore, the overcontrol parameter also failed to show sufficient variance and reliability for these judgements. Alternatively, the overcontrolled type may be not sufficiently frequent at this age, or in the specific sample which would lead to a restricted range of variance in overcontrolness. However, the three personality types were empirically identified in the parental judgements through replicated cluster analysis and showed a sufficient similarity with the types identified in the Berlin Relationship Study (see Asendorpf et al., 2001; Asendorpf, 2003). In addition, the relative frequency of overcontrollers identified in the present study varied between 22% and 30% between the four assessments (self vs. parent, age 12 vs. 17) and was highly similar to the relative frequency of undercontrollers which varied between 25% and 32%.

Instead, a high collinearity between overcontrolness and either elevation or undercontrolness seems to be the reason for the failure to find a reliable overcontrol parameter. Overcontrolness correlated −0.77 or even more negatively with both elevation and undercontrolness. Multivariate procedures such as HLM tend to strengthen the more reliable variable at the expense of the less reliable one, which can lead to large discrepancies in the reliabilities of two collinear variables. Because the strong collinearity was replicated across ages and judges, it does not seem to be a chance finding; instead, this result raises the question why overcontrolness showed such high negative correlations with elevation or undercontrolness.

Inspection of the intercorrelations of the Big Five scales at the four assessments indicated that emotional stability showed significant correlations in the range of 0.20 to 0.40 with conscientiousness, agreeableness and culture for all four assessments, whereas these correlations were not significant for the NEO-FFI in adults. Similarly, extraversion was significantly correlated with agreeableness and culture in the same range for all four

assessments, whereas these correlations were not significant for the NEO-FFI. Thus, the two-marker variables for overcontrol were correlated with one- or both-marker variables for undercontrol and culture, and therefore with elevation. This correlational pattern suggests that the failure to find a reliable overcontrol parameter was due to an insufficient discriminant validity of the markers for overcontrol with regard to the markers for both undercontrol and elevation, which may be due to the instrument for assessing the Big Five, the young age of the sample, or to the composition of the LOGIC sample. These alternative interpretations cannot be further reduced because the instrument was only used for this sample.

GENERAL DISCUSSION

This study applied a new method of analysing personality profiles to two longitudinal samples. The resulting elevation and typeness scores showed significant interindividual variation, sufficient individual reliability, and sufficient short- and long-term stability for NEO-FFI self-ratings of adults, but insufficient interindividual variation and individual reliability for Big Five self- and parental judgements of (pre)adolescents which seems to be due to an insufficient discriminant validity of the marker variables for overcontrol as compared to the markers for undercontrol and elevation.

This mixed finding suggests that the proposed new method of analysing personality profiles requires clearly distinct markers for the personality types on which the profile parameters are based. This sensitivity to violations of the discriminant validity of the markers can be viewed either as a weakness of the method, or as a strength. On the one hand, the method can be profitably used only for clearly distinct markers of types which restricts its applicability. On the other hand, the method forces one to use clearly distinct markers because of in-built safeguards such as, significance tests for the interindividual variation of the typeness scores and the computation of sensitive reliability indices. These safeguards prevent applications to data structures where differences between the personality types are not assessed by sufficiently distinct marker variables.

If the method can be successfully applied, as in the Berlin Relationship Study, the longitudinal stability and the predictive validity of the continuous profile parameters is likely to be much higher than the stability and validity of the discrete types on which they are based. Thus, the new method may to a great extent overcome the problem of relatively low predictive validity of discrete types that was identified in recent research by Costa et al. (2002) and Asendorpf (2003). The new method may also yield continuous parameters that show a higher replicability across different studies than the discrete types identified with cluster analysis.

Therefore, the main message of the present study is that person-centred analyses of ordinary personality scales are not restricted to the analysis of discrete types. Continuous indices of typeness can be obtained that scales equal in terms of external validity and even outperform factors in terms of longitudinal stability. Thereby the new class of typeness measures overcomes many limitations of the discrete-type approach.

Broad range of application

Although the present study applied the new method only to Big Five data sets, and the frequently found types overcontrollers and undercontrollers, it should be noted that the method is much more general. It can be applied to any other personality types based on

the Big Five or on any other multidimensional system of personality description, provided that the differences between these types are assessed by sufficiently distinct marker variables. The method can be applied to any continuous trait scores, for example scales, ratings, behavioural assessments, physiological measures.

Computation of profile parameters

In the present study, the HLM model and programme was used for computing empirical Bayes (EB) estimates of the individual elevation and typeness parameters. Is should be noted that alternatively OLS scores can be computed, also without using HLM. In most cases, both methods may result in highly similar estimates. In the present studies, the EB estimates correlated above 0.95 with the OLS estimates in all data sets. It should be noted, however, that even highly correlated variables can have clearly different correlates. A particular advantage of the EB estimates is that extreme scores are avoided if they are not reliably estimated because EB scores weigh OLS scores with their reliability. This is particularly important if the profiles are based on only few traits.

Alternative approaches

Recently, Kim, Frisby and Davison (2004) described a similar procedure based on multidimensional scaling, Profile Analysis via Multidimensional Scaling (PAMS).[4] First, latent profiles are identified with multidimensional scaling. Subsequently, person parameters are computed by regressing the individual profiles on the latent profiles, and these person parameters and the profile elevation are used for predicting external variables. The second part of this procedure is similar to the computation of typeness scores in the present approach. Another procedure starts with a criterion variable and identifies a pattern of predictor scores, the criterion pattern, which is first cross-validated and then used for predictive purposes (Davison & Davenport, 2002).

One reviewer suggested to implement the typeness concept within a structural equation approach. Factors representing the prototypic profiles and elevation could be created as well as a factor representing the criterion variable. The Big Five scores could be represented by a series of factors, and the dummy codes for the types could also be included in the model. Such an alternative approach seems interesting indeed but is clearly outside the scope of the present.

The present approach of decomposing personality profiles into elevation and typeness scores is surely not the only possible one that uses idiographic pattern information for prediction. What seems to be unique is its reliance on *a priori* defined prototypic profiles that are identical across different samples and even across different instruments (e.g. NEO-FFI vs. another Big Five inventory), and the use of empirical Bayes estimates of within-person regression coefficients.

Person-centred versus variable-centred approach

A key characteristic of the present approach (as well as the PAMS approach by Kim et al., 2004) is that it makes full use of intraindividual differences between the profile scores. In contrast, the traditional multiple regression approach ignores these intraindividual differences; instead, the individual scale scores are weighted with the same weights for

[4]When I developed the present approach in collaboration with Dan Ozer, I was not aware of the Kim et al. (2004) approach; I am grateful to Ivan Mervielde for making me aware of it.

all individuals. Therefore, the present approach can be characterized as primarily person-centred, and the traditional approach as variable-centred, even though the present approach is also secondarily variable-centred when it comes to the second step of predicting an external criterion from the individual elevation and typeness scores.

Furthermore, the traditional approach derives the constant weights *a posteriori* from properties of the sample, whereas the typeness scores are derived from *a priori* defined prototypic profiles that are not dependent on properties of the sample. This fact may be the main reason why the typeness scores proved to be highly stable despite the fact that they were computed with within-person regressions that were based on only a few data points and thus not very reliable.

It may be objected that the proposed new approach did not outperform the traditional scales in terms of external validity. Why should one construct secondary variables (profile parameters) from primary variables (Big Five scales) that are ready to be used anyway? Is the present approach more than an interesting but unnecessary exercise in methodology?

Constructing typeness measures from a person-centred perspective is a means for information reduction just as extracting factors from a variable-centred perspective. If three factors explain the same amount of external variance as five scales do, most researchers would agree that these factors are useful despite the fact that factor analysis has to be applied to derive them. In the Berlin Relationship Study, three profile parameters explained virtually the same external variance as five scales did. Thus, they proved to be as efficient as factors but showed a higher longitudinal stability.[5]

Furthermore, one objection to factors is that they are often ambiguous because their psychological meaning is derived from interpretations of complex patterns of factor loadings. In contrast, the proposed typeness measures are less ambiguous because they relate to a concrete prototypic personality pattern that can be easily described in terms of bipolar personality attributes.

Last but not the least, because of their intimate connection to discrete personality types, typeness measures profit from the communicative advantage of discrete types over variables that has been regularly pointed out in discussions of the merits of a discrete type approach (e.g. Asendorpf et al., 2001, 2002; Costa et al., 2002). The concept of a personality type is intuitively more appealing to the public than a continuous personality dimension, and clinicians and public health authorities frequently use categorical classifications and are trained to frame questions and answers in terms of increase and decrease of risk for groups of people. The concept of typeness can serve as a bridge between the statistically educated who want to preserve the full information about personality differences in multivariate space for their analyses, and those who prefer to conceptualize personality or clinical syndromes in terms of discrete types.

For example, a possible outcome of the current debate about introducing clinically relevant dimensions in DSM-V (see e.g. Phillips, First, & Pincus, 2003) is a split into two worlds, the world of the clinicians who continue to use categories, and the world of the researchers who prefer dimensions. The concept of typeness could prevent these two

[5]As a note of caution, it should be added that the predictive validity of typeness scores depends on the fit between the prototypical profiles and the predicted criterion. For example, both overcontrollers and undercontrollers have average openness scores according to the *a priori* profiles in Figure 2, Panel B. Therefore undercontrolness and overcontrolness may only poorly predict criteria related to openness such as, general intelligence or school achievement that were not assessed in the Berlin Relationship Study. The LOGIC data reported in Table 6 tend to confirm this expectation.

worlds from drifting apart by providing a common typological language that can be used in different ways by different kinds of people.

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APPENDIX

HLM model for parameter estimation

Level-1 Model (level of the individual)

$Y = B0 + B1*(OVER) + B2*(UNDER) + R$

Level-2 Model (level of the sample)

$B0 = G00 + U0$
$B1 = G10 + U1$
$B2 = G20 + U2$

where

B0 = intercept (individual profile elevation)
B1 = overcontrolness (slope for grand mean centered overcontrol)
B2 = undercontrolness (slope for grand mean centred undercontrol)
G00 = mean B0 (sample mean for profile elevation)
G10 = mean B1 (sample mean for overcontrolness)
G20 = mean B2 (sample mean for undercontrolness)
U0, U1, U2, R random errors

The individual parameters B0j, B1j, B2j for $j = 1, \ldots, n$ individuals are estimated as
OLS scores = ordinary least squares estimates
EB scores = empirical Bayes estimates
Notation as in the HLM output (explanations in parentheses)

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