

Correcting Big Five personality measurements for acquiescence:

An 18-country cross-cultural study

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Abstract

For groups of persons with low or medium levels of education, Big Five personality scales typically yield scores that poorly replicate the idealized Big Five factor pattern. On the basis of representative samples of German adults, Rammstedt et al. (2010; 2011) have demonstrated that correcting each person's score for acquiescence eliminates this problem. In the present 18-country study using large samples representative of each country's adult population, we found that, in all cases, correcting for acquiescence did indeed improve the congruence of factor loadings with an idealized Big Five pattern. However, while this correction led to acceptably high correspondence levels in all countries classified as individualistic, this was not always true for non-individualistic countries. Possible reasons for this finding are discussed.

Acquiescent responding has a distorting impact on the psychometric quality of questionnaire data (e.g. Rammstedt, Goldberg, & Borg, 2010; Rammstedt & Kemper, 2011; Soto, John, Gosling, & Potter, 2008). Acquiescence refers to the tendency of an individual to consistently agree to questionnaire items, regardless of the content of the items (Jackson & Messick, 1958; Javeline, 1999). Results of previous studies indicate that such “yea-saying” appears to be more frequent among persons with lower educational levels (e.g., Ayidiya & McClendon, 1990; Narayan & Krosnick, 1996; Rammstedt, Goldberg, & Borg, 2010; Rammstedt & Kemper, 2011). There are several hypotheses aiming to explain this educational difference. The most plausible explanation is that the less educated are not as used to thinking abstractly and to considering the hypothetical but are rather tied more to the concrete and immediate (Flavell, Miller, & Miller, 1993; Toomela, 2000, 2003a, 2003b). These competencies, furthermore, are assumed to be related to a person’s likelihood to arrive at meaningful judgments describing himself in relatively abstract psychological terms. Hence, judgments by less educated should be more affected by systematic response biases such as acquiescence (cf. Goldberg, 1963; Soto et al., 2008).

Factor solutions may be blurred by acquiescence, because individual differences in acquiescence will inflate correlations between items that measure unrelated constructs but are keyed in the same direction, and will deflate correlations between items that measure the same construct but are keyed in the opposite directions. Thus individual differences in acquiescence significantly decrease the factorial validity of questionnaires. The most established factorial model in personality consists of the so-called Big Five factors of personality (cf. De Raad, 2000; Goldberg, 1990; John, Naumann, & Soto, 2008) aiming to describe a person’s personality structure on the most global level. These global dimensions are interpreted and commonly labelled as Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience.

Recent studies (Rammstedt, Goldberg, & Borg, 2010; Rammstedt & Kemper, 2011) suggest that the structure of item sets assessing the Big Five personality factors is sensitive to effects of acquiescent responding. In samples of persons with low and medium education and thus in samples more prone to acquiescence, the Big Five structure emerged only in a blurred way. While in samples consisting of respondents with a high level of education and thus in samples less prone to acquiescence the Big Five replicated with textbook-like clarity. This educational effect could be substantially reduced by correcting for acquiescent response bias. When this bias was controlled for, the Big Five factor structure became much clearer, reaching good levels of congruence with idealized Big Five loading patterns both for high-educated respondents and for respondents with a low or medium level of education.

As the effect of acquiescence blurring the Big Five factor structures has only recently been identified, the empirical evidence for its generalizability is still scarce. The two studies that have been conducted so far are both based on representative samples of German adults. Both show (1) that acquiescent responding is significantly and substantially more pronounced in low and medium-educated groups than in groups with a high level of formal education; (2) that the Big Five factor structure is blurred by acquiescence; and (3) that statistically controlling for acquiescence clearly improves the congruence of factor structures with ideal patterns, thereby yielding solutions that have at least an acceptable good fit to the ideal Big Five structure. As both these studies are based on German samples, one can ask to what extent this effect can also be replicated in other cultures – in cultures more or less comparable with, and in cultures that differ greatly from the German culture.

The findings described above are supported by other studies. Several earlier studies (Krosnick, Narayan, & Smith, 1996; McClendon, 1991; Meisenberg & Williams, 2008; Mirowsky & Ross, 1991; Winkler, Kanouse, & Ware, 1982) have suggested that acquiescent

responding is related to education. Thus, as a default hypothesis, we expect the following to hold true in general:

H1: In all cultures, the average level and the variability in acquiescent responding are greater in less-educated respondents than in more-educated respondents.

Our own previous studies based on German samples suggest that interindividual differences in acquiescent responding blur the Big Five factor structure in educationally heterogeneous samples. In particular, samples with lower-educated respondents seem to be affected. By subtracting each individual's mean item score from each single item score in a balanced battery of ten Big Five items, we statistically controlled for interindividual differences in acquiescence in these samples, leading to a much clearer Big Five factor structure. The assumption that differences in acquiescence blur the Big Five factor structure is also supported by Soto and colleagues (2008) who showed that children and adolescents exhibit greater interindividual variability in acquiescence than adults, and that this negatively impacts the factorial structure of their personality ratings. Controlling for acquiescence (by ipsatizing the data) improved the recovery of the intended Big Five structure. Hence we hypothesize:

H2: Statistically controlling for acquiescence generally leads to a factor structure that is more congruent with an idealized Big Five structure.

Our own studies (Rammstedt et al., 2010, 2011) suggest that the negative impact of acquiescence variability on the factor structure is more pronounced among low and medium-educated respondents than among respondents with a high level of education. Therefore, we hypothesize that correcting for acquiescence leads to correspondingly greater improvements in factor congruence in the case of lower and medium educated respondents. As there is no apparent reason why this should hold for German samples only, we hypothesize for all countries:

H3: Samples of low and medium-educated persons exhibit Big Five factor structures that are less congruent with ideal Big Five patterns than do samples of persons with a high level of education.

H4: Statistically controlling for acquiescence variability leads to greater improvements in the congruence of empirical and ideal factor structure for low and for medium-educated persons than for persons with a high level of education.

Recently, research on response styles in different cultures has received considerable attention (e.g., Clarke, 2001; Diamantopoulos, Reynolds, & Simintiras, 2006). However, almost all of these studies have focused on cross-cultural differences rather than on cross-cultural generalizability. There is some evidence that cultures differ in their propensity for acquiescent responding as reflected in mean-level differences (e.g., Javeline, 1999; Johnson, Kulesa, Cho, & Shavitt, 2005). This appears to be especially true for the individualism-collectivism dimension – a dimension that is sometimes also regarded as the “deep structure” of cultural differences (cf. Greenfield, 1999). As a possible reason for this effect, Javeline (1999) argues that “Yea sayers” are more likely in “polite” societies.

With reference to the quality of the emic Big Five structures, previous studies also indicate differences between individualistic and collectivistic – or non-individualistic – cultures. Not surprisingly, as the Big Five structure was originally identified in an individualistic country – the United States – replications of the Big Five in individualistic countries show greater congruence with this original solution than replications from non-individualistic cultures (cf. Church & Katigbak, 2000; Guanzon-Lapena, Church, Calota, & Katibak, 1998).

As educational bias in acquiescence, and the effectiveness of correcting scores for acquiescence have been found in Germany, a country typically regarded as individualistic, we hypothesize as an alternative to the universal hypotheses proposed above that:

H5: The educational bias in acquiescence, and the effectiveness of correcting scores for acquiescence, will be replicable primarily in countries with a culture similar to Germany's, that is, in individualistic cultures.

H6: The congruence of the Big Five factor structures will be greater in individualistic cultures than in non-individualistic cultures.

The present study aims to test these six hypotheses. For that purpose, data representative of the adult population of 18 countries that differ in terms of their political and economic situation and their cultural values were investigated.

Method

Samples and Procedure

Our analyses are based on the data of Round 2005 of the International Social Survey Programme (ISSP) 2005 (www.issp.org; <http://dx.doi.org/doi:10.4232/1.4350>; Haller, Jowell, & Smith, 2009). A short measure of the Big Five¹ was assessed in 18 of the 31 countries participating in this round. Data of these countries are analysed in the present study.

Without exception, the ISSP surveys were all based on representative samples of the countries' adult populations (age ≥ 18).² The sampling procedure varied across countries. In several countries, register-based samples were drawn (where possible); in other countries, a household sampling procedure was used. In the latter case, households were selected randomly on the basis of complete block lists. Similarly, respondents within the households were randomly selected from a full list of household members. Full details of the sampling procedures in the different countries are presented in the methods report of the ISSP 2005 (Scholz, Harkness, & Faass, 2008).

Sample size per country varied from $N = 921$ in Japan to $N = 2,171$ in Taiwan. Overall, the realised sample consisted of $N = 25,509$ respondents. Details of the sample composition per country are given in Table 1.

ISSP questionnaires are administered as face-to-face interviews or in a self-completion format. Participation was voluntary and not usually financially rewarded – although some countries offered small incentives in order to enhance participation.

Measures

Education

Levels of educational attainment were assessed in all countries on the basis of the national education system. Afterwards, the ISSP researchers harmonised these national data by mapping them into six categories: “no formal qualification” (0), “lowest formal qualification” (1), “above lowest qualification” (2), “higher secondary completed” (3), “above higher secondary level” (4), “university degree completed” (5). These categories were defined with reference to the International Standard Classification of Education (ISCED) 1997 levels. In order to have a sufficient number of respondents in each group, we collapsed these six categories into two educational groups on the basis of the ISCED levels³: *low or medium education* (\leq ISCED level 3), which comprises respondents with a level of education lower than that of university students typically investigated in personality research; and *high education* (\geq ISCED level 4). Table 1 shows the distributions of the samples in the low and medium-educated group and in the group with a high level of education. Depending on the education system, these distributions differ markedly across countries. They range from 40% low and medium-educated and 60% high-educated respondents in Russia, to 90% low and medium-educated and 10% high-educated respondents in the Czech Republic. These differences might be due to differences in non response bias among the countries with some countries showing greater effects for education than others. These differences might also be a consequence of the somewhat arbitrary classification into low or medium and high education strongly reducing variance and differences among the different educational systems.

Cultural values

Country-level scores on an individualism-collectivism scale were taken from Hofstede (2001; see also Hofstede & Hofstede, 2004) for the 18 ISSP countries used in this study. Countries were classified into three groups – high (=3), medium (=2), and low (=1) individualistic – based on their individualism-collectivism scores. For two countries (the Dominican Republic and Latvia), no country-level scores were available. On the basis of the ratings of comparable countries, we assigned imputed individualism-collectivism scores to these two countries. As all other Caribbean countries are classified by Hofstede as having a low level of individualism, we assumed this to hold true for the Dominican Republic as well. We classified Latvia as medium individualistic because Estonia, the neighbouring Baltic country, is rated this way. Based on the classification by Hofstede, eight of the 18 ISSP countries were classified as high individualistic cultures, five as medium individualistic cultures, and five as low individualistic cultures (cf. Table 2).

The ten-item Big Five Inventory (BFI-10)

The ten-item Big Five Inventory (BFI-10; Rammstedt & John, 2007) is an abbreviated version of the well-established Big Five Inventory (BFI; John, Donahue, & Kentle, 1991; see also Benet-Martínez & John, 1998; John et al., 2008; for the German version see Lang, Lüdtke, & Asendorpf, 2001; Rammstedt, 1997), consisting of ten of the 44 standard BFI items. It assesses the Big Five with two items per factor, one keyed in the positive and one in the negative direction.

In accordance with the response format used throughout the ISSP questionnaire, all items used five-point Likert-type response options ranging from *fully agree* to *fully disagree*. Although this response scale differs in its orientation from the standard BFI-10 format (*fully disagree* to *fully agree*), a previous study showed that reversing the direction of the response scale does not change the quality of the ensuing responses (Rammstedt & Krebs, 2007). All ten items were re-coded for the present analyses so that *fully disagree* was scored as 1 and *fully agree* as 5.

Analyses

Acquiescence

An acquiescence index was computed for each respondent based on the ten BFI items. The BFI-10 has two balanced keyed items for each of the Big Five factors. For example, Extraversion is assessed by the items “I see myself as someone who is reserved” and “I see myself as someone who is outgoing, sociable.” If an individual responds consistently to the content of the two items, the responses to these items should be symmetrical about the answer scale’s middle category (coded as “3”). High acquiescence, by contrast, should result in a mean rating greater than 3 based on a response scale coded from 1 to 5, indicating that agreement to the positive item is stronger than rejection of the negative item. Low acquiescence, namely the tendency to generally disagree with items (i.e., “nay-saying”), should result in a mean rating lower than 3. Because there are five item pairs, we used the mean over all items as a measure of each individual’s acquiescent response tendency. In order to test whether acquiescence affected all five dimensions to the same degree, we computed acquiescence scores for each dimension (as a mean across both items per dimension) and investigated the interrelations of these scores. These correlations range from .08 to .21 with an overall mean of .15.

Controlling for Acquiescence

One common technique to remove variance due to response tendencies from personality questionnaires is ipsatization (Clemans, 1966; Cunningham, Cunningham, & Green, 1977; Fischer, 2004; Ostendorf, 1990; Ten Berge, 1999). Depending on the theoretical and conceptual interest of the researcher, standardization of item scores may involve adjustments using each person’s means, standard deviations, or both. If researchers expect acquiescent response bias, and if this bias is their primary interest, the use of means to adjust item scores is indicated (cf. Fischer, 2004). Ten Berge (1999) also proposed as an alternative approach to use linear regression to partial variance due to acquiescence. This approach

differs to the subtraction of the mean in that it only affects the variables to the extent that they correlate with the mean (Ten Berge, 1999, p. 97). However, as our aim is to apply a method of controlling for acquiescence that is not sample-dependent, we chose to use the established subtraction method instead. Therefore, we subtracted each respondent's mean response across all BFI-10 items from his/her score on each single item. To control for potential method effects, we applied both the subtraction method and the regression-based approach to the total and the subsamples of one country, namely the USA. Results were highly similar across both methods.

Factor Analyses

To avoid variations in results due to methodological differences, we kept our method aligned with that applied in previous studies (Rammstedt et al., 2010; 2011) and with the assumptions of the Big Five model. PCAs with a forced extraction of five factors were conducted. All factor solutions were subsequently rotated to an optimal fit with (a) the “simple structure” criterion (using Varimax rotation), and (b) an idealized 10-item 5-dimensional Big Five factor structure (using Procrustes rotation as advocated by McCrae, Zonderman, Costa, Bond, and Paunonen, 1996 and Allik and McCrae, 2004).

Congruence of the factor structures

The similarity of two 5-dimensional factor solutions, \mathbf{X} and \mathbf{Y} , can be assessed by computing the congruence coefficient c . To find the value of c which indicates a level of congruence that is significantly greater than what one can expect for random configurations \mathbf{X} , Rammstedt et al. (2010) provided simulation norms. They reported that for the case studied in this paper (ten vectors, five dimensions, with \mathbf{Y} the idealized Big Five pattern with +1, 0, and -1 loadings), a coefficient greater than .78 is the critical benchmark value of the random congruence. For random \mathbf{X} , congruence of $>.78$ can be expected in less than 1% of the cases. Therefore, such similarity indices are considered statistically significant. However, these statistical norms are only weak benchmarks, because, as Lorenzo-Seva and Ten Berge (2006)

have shown, “seasoned factor analysts” are likely to interpret **X** and **Y** as “fairly” similar only if the congruence coefficient c is at least .85.

The hypothesized better matches of the empirical and the ideal factor structures are thus empirically testable using the following three criteria:

- a. Congruence coefficients increase after controlling for acquiescence.
- b. After controlling for acquiescence, congruence coefficients exceed the 99% norms for statistically significant congruence ($c > .78$).
- c. After controlling for acquiescence, congruence coefficients should reach or exceed the .85 criterion proposed by Lorenzo-Seva and Ten Berge (2006) if the factor structures are to be interpreted as at least “fairly” similar.

Results

Differences in acquiescent response bias (H1)

To test hypothesis H1, means and standard deviations of the acquiescence scores for each country were computed. As we assume that the tendency towards acquiescence should be generally more pronounced and more variable in low and medium-educated groups than in high-educated groups, Table 2 shows the mean acquiescence scores and their variability for each country's total sample (columns 3 and 4) and for each educational group (columns 5 and 6, and columns 7 and 8, respectively). Overall, the various countries differ in the extent and direction of the hypothesized educational effect. In seven of the 18 countries, the mean acquiescence scores of low and medium-educated respondents were significantly higher than those of respondents with a high level of education. In six countries, the effect was not significant, and in the remaining five countries an inverse effect was found, with high-educated respondents scoring higher on acquiescence than persons with a low or medium level of education. Concerning the variability of acquiescence scores, expected differences were found for eight of the 18 countries. In these countries, the standard deviations for low

and medium-educated groups were higher compared to those of the high-educated groups. For the remaining countries, no significant differences were observed. Notably, no effects contrary to expectations were substantial. In sum, these results do not support our hypothesis H1 for all countries. About half of the countries showed the predicted effects with regard to educational differences in mean and variability; for the other half no such effects were found.

Factor structure of the raw scores and the scores corrected for acquiescence (H2)

According to hypothesis H2, we assume that variability in the general tendency towards acquiescent responding blurs the Big Five factor structures in all countries. Controlling for acquiescence variance should universally improve the congruence of the factor structures with an ideal Big Five pattern. To test this hypothesis, we conducted two sets of factor analyses based on the ten BFI-10 variables for each of the 18 countries separately. One set was based on the raw data, and one on the data corrected for acquiescence.

In order to keep the results presented here to a reasonable size, we will as an example report detailed results for one country only, namely the USA. For all remaining countries, summarised results will be reported.

The top half of Table 3 shows the Procrustes rotated⁴ factor loading matrix for the ten raw BFI-10 items for the U.S. sample. In this table, pairs of items measuring the same factor are re-ordered and listed in adjacent rows. In addition, the factors are ordered (from left to right) according to their loadings on the items. Results for the total sample are displayed on the left. The explained variance is 66%. As can be seen from the loading matrix, the Big Five factor solution is distinctly blurred and does not match the criterion of simple structure. Every item – with the exception of the two Emotional Stability items – has substantial loadings on non-corresponding factors. The ambiguity of the structure is also reflected in the factor congruence coefficients that measure the fit of the empirical factor loadings with the ideal loadings (after optimal reflections and permutations of the factors). Following the benchmarks

proposed by Lorenzo-Seva and Ten Berge (2006), congruence coefficients of .85 or higher (set in bold in Table 4) can be interpreted by “seasoned factor analysts” as an indication that the two structures are “fairly” similar. For the U.S. data, the congruence coefficients vary between .66 and .96 for the five factors, with a total matrix fit of .86, which just meets the benchmark value.

To test whether controlling for acquiescence variance does indeed increase the clarity of the Big Five factor structures (i.e., hypothesis H2), we repeated the factor analyses for each country by using the mean-corrected scores described in the Method section above.

The lower half of Table 3 shows the detailed factor analytical results based on the mean-corrected data for our example country, the USA. The explained variance is 71%. The factor loading matrix based on the scores corrected for acquiescence reflects the Big Five with textbook-like clarity: All items load substantially and highest on their corresponding factors, and none of the secondary loadings exceed .35. The good fit of the factor structure is also reflected in the congruence coefficients, which range between .92 and .96 for the five factors, with a total matrix congruence of .95. Therefore, correcting for acquiescence yields a markedly better factor structure in the U.S. sample.

Summarised factor analytical results for all 18 countries are reported in Table 4 in the form of congruence coefficients for the full matrix – for Varimax and Procrustes rotation separately. The countries in the table are sorted in descending order according to their level of individualism. Columns 2 and 10 show the congruence scores for the raw data, columns 6 and 14 feature the scores for the data corrected for acquiescence. As can be seen from the table, the two methods of rotation yield similar results, even though congruence scores based on Procrustes rotation are necessarily always somewhat higher than those based on Varimax rotation.

In the case of the raw score data, the factorial fit is rather poor overall, which indicates that factor structures are blurred in all countries. The various countries differ in their mean

congruence. However, a congruence of .85 is reached in only two of the 18 countries – the USA (in the case of the Procrustes rotation only) and Switzerland – which indicates theoretically unacceptable factor structures in at least 16 of the 18 countries.

Whether the factorial match increases when acquiescence is controlled for is tested by the three criteria formulated in the Method section. Our first criterion is a mere increase in congruence of the mean-corrected data compared to the raw data. This criterion is fully met. In all countries, and under both methods of rotation, congruence coefficients based on the corrected data are higher than those based on the non-corrected data.

According to the second criterion, congruence coefficients based on the corrected data should meet the benchmark of $>.78$ that allows rejecting random congruence (cf. Rammstedt et al., 2010) more often than the coefficients based on the uncorrected data. This was indeed the case. Based on the uncorrected data, a congruence significantly deviating from chance was reached in only 6 countries under Varimax rotation and 9 countries under Procrustes rotation; based on the corrected data, the criterion was satisfied in 14 of the 18 countries.

Our third criterion requires that the congruence coefficients should be even higher ($\geq .85$) before the factor structures can be interpreted as a theoretically good fit. Based on the uncorrected data, this criterion was met in only one country under Varimax, and in two countries under Procrustes rotation. Based on the data corrected for acquiescence, a good fit was reached by 10 of the 18 countries using Varimax, and by 13 countries using Procrustes rotation. Therefore, H2, which hypothesizes better-fitting factor structures after correcting for acquiescent response bias, is clearly supported in terms of all three criteria.

Educational differences in the factor structures (H3 and H4)

In order to test H3 – that the factor structures in the low and medium-educated samples are more severely blurred than those in the high-educated samples – factor analyses based on the raw score data were repeated separately for the two educational groups. For our sample country, the USA, Procrustes-rotated factor loading matrices of the raw data are

reported in the top half of Table 3. The results clearly support our hypothesis – at least for the USA, where the Big Five emerged in an unbiased way only in the high-educated samples. In the low and medium-educated samples, the factor structure is distinctly blurred. Differences in the factor structures are also reflected in the congruence coefficients of the factors. For the low and medium-educated sample, these coefficients vary between .61 and .94, with a congruence of the total matrix of .80. For the high-educated sample, by contrast, congruence ranges between .77 and .97, with a total matrix fit of .91.

Summarised factor analytical results for the raw data of all 18 countries for each educational group are reported in Table 4 (columns 3 and 4 and 11 and 12). Once again, results are given in terms of the full matrix congruence coefficients based both on Varimax and on Procrustes rotation.

As hypothesized, the congruence coefficients are lower in the low and medium-educated group than in the high-educated group in 16 of the 18 countries under Varimax and in 14 countries under Procrustes rotation. In the two (Varimax) and four (Procrustes) remaining countries respectively, no differences between the educational groups were observable. Hence the results support – at least tentatively – the assumption of a more severely blurred factor structure in the low and medium-educated group compared to respondents with a high level of education (H3).

Our hypothesis H4 assumes that statistically controlling for acquiescence variance yields better-fitting Big Five patterns for all educational levels. This increase is expected to be more pronounced for those with a low or medium level of education. To test this hypothesis, we again conducted factor analyses for each educational group based on the data corrected for acquiescence. For our sample country, the USA, factor-loading matrices of the corrected data are reported in the bottom half of Table 3. To test for the better fit of the factor structures, we again used the three criteria formulated in H4: congruence coefficients would (a) increase, (b) exceed .78, and (c) exceed .85. In the case of the USA, the results clearly met these three

criteria. We found a higher increase in the factorial fit for the low and medium-educated samples; for both educational groups, both benchmarks were met for each factor. In addition, the factor-loading matrices reflect a clear simple structure, unambiguously interpretable in terms of the Big Five. In both educational groups, all items load substantially and highest on their corresponding factors and none of the secondary loadings exceeds .35.

Results in terms of mean congruence coefficients for all 18 countries under both Varimax and Procrustes rotation are given in Table 4. Columns 7 and 15 display the results for the low and medium-educated respondents, while columns 8 and 16 show the results for the high- educated group. For the low and medium-educated respondents in all 18 countries, we found higher congruence coefficients under both methods of rotation after controlling for acquiescence. When comparing the high educated on the basis of both raw and corrected data, this was true for 14 (Varimax) and 17 (Procrustes) of the 18 countries respectively. The increase in congruence was slightly higher on average for the low and medium-educated respondents (.15 and .11 for Varimax and Procrustes, respectively) compared to the high-educated group (.07 and .09 for Varimax and Procrustes, respectively).

For the other two criteria, the picture was even clearer: In the low and medium-educated samples, based on the raw data, only 3 (Varimax) and 6 (Procrustes) countries respectively met the .78 criterion, and only one (Switzerland) just met the .85 criterion. After controlling for acquiescence, this ratio increased to 12 (Varimax) and 14 (Procrustes) countries respectively for the .78 benchmark, and to 10 countries for the .85 criterion. In the high-educated samples – even based on the raw data – 8 (Varimax) and 11 (Procrustes) countries respectively met the .78 criterion and 3 fulfilled the .85 criterion. After controlling for acquiescence, 10 (Varimax) and 14 (Procrustes) countries respectively exceeded .78, while 9 (Varimax) and 12 (Procrustes) countries respectively exceeded .85.

In sum, all three criteria indicate an increase in the factorial fit after controlling for variance in acquiescence, and this increase is bigger for the low and medium-educated group

than for the high-educated respondents. Therefore, results indicate (a) a clear improvement of the factor structures and (b) diminished educational differences when acquiescence is controlled for.

Investigating differences between countries (H5 and H6)

Finally, we set out to test whether systematic differences among the countries can be found in the sense that individualistic countries show effects similar to those found for Germany in previous studies (H5 and H6).

The hypotheses are clearly supported by the data. The educational bias in acquiescence is more pronounced in the individualistic cultures. For 6 of the 8 individualistic countries we found the hypothesized effects, with low and medium-educated respondents scoring significantly higher than high-educated participants. Similarly, we found for 5 of the 8 countries that lower and medium-educated respondents show a markedly higher variability in their acquiescence scores compared to high-educated. In the remaining two, respectively three countries, the educational groups did not differ significantly. In the 10 non-individualistic cultures, however, only one country (Israel) showed both the mean-level and the variability effect in the intended direction. No other country showed the hypothesized mean-level effects and only two other countries the assumed variability effects.

The fit of the factor structures also varies with the country's classification on the individualism/collectivism dimension. In the individualistic countries, a very homogeneous picture emerges. Even in the case of the raw score data, the congruence of the Big Five patterns is higher for these countries than for the non-individualistic ones (on average .80 (Varimax) and .82 (Procrustes) respectively compared to .61 and .71 respectively). This difference remained more or less constant after controlling for acquiescence (.92 and .93 respectively compared to .78 and .82 respectively). In all 8 individualistic countries – under both methods of rotation – and in both educational groups – with the exception of Ireland for the low and medium-educated respondents – congruence exceeds the criterion of .85 for an

acceptable fit. In the 10 non-individualistic countries, by contrast, the results were much more heterogeneous. For some countries (Russia and Taiwan) we found good fitting results (both for the total sample and the two educational groups). For most of the countries, however, congruence did not reach the .85 criterion (for either the total sample or the two educational groups).

Discussion

Previous research based on representative samples of the German adult population (Rammstedt et al., 2010, Rammstedt & Kemper, 2011) have found that interindividual differences in acquiescent responding may blur the Big Five factor structure. The aim of the present study was to investigate whether this effect is, in fact, universal and can thus be replicated in countries or cultures other than Germany. Based on the results of our own and other previous studies in this field, we formulated six hypotheses: We expected acquiescent responding to be more pronounced and more variable among low and medium-educated respondents compared to high educated respondents in all countries (H1). Furthermore, we hypothesized that individual differences in the tendency to acquiesce blurs the Big Five factor structures, and that correcting for this response bias leads to clearer Big Five factor structures in all countries (H2). As low and medium-educated respondents are assumed to be more prone to acquiescent responding and within the group more variable, we hypothesized that the Big Five factor structures of low and medium-educated respondents would be relatively more blurred (H3). Moreover, we anticipated that correcting for acquiescence would yield better fitting Big Five structures for both educational groups, but that this increase would be more pronounced in the low and medium-educated group (H4). Based on previous research indicating systematic cultural differences in the quality of Big Five solutions and in acquiescence, we expected that individualistic countries would display better-fitting factor structures overall; with regard to acquiescence, we anticipated relatively homogeneous results in the sense that the effects previously identified for Germany would be replicable in all

individualistic countries (H5 and H6). We did not formulate any clear-cut hypotheses for the non-individualistic cultures. Rather, we assumed a more heterogeneous picture overall.

We tested our hypotheses on the basis of large data sets representative of the adult population of 18 countries from all over the world. The results of our analyses clearly support most of our hypotheses. We identified a general tendency towards acquiescent responding, which seems to have a biasing effect on the Big Five structures in all countries. Controlling for acquiescence markedly increased the fit of the factor structures in each of the 18 countries (H2).

The fit of the factor structures differed systematically across countries (cf. H5 and H6). As hypothesized, we found markedly higher and more homogeneous congruence coefficients for the individualistic countries, where all indices exceeded our statistical benchmark criterion, even based on the raw-score analyses. Our findings are thus comparable to those reported by De Raad, Perugini, Hrebickova, and Szarota (1998), whose investigation of Big Five congruences in eight Western countries yielded coefficients between .77 and .85. However, as De Raad et al. investigated only student samples and, thus, samples comparable with our high-educated group, our findings even appear to outperform theirs.

For both individualistic and non-individualistic cultures, we found roughly the same increase in factorial fit after controlling for acquiescence variance, so that, based on the corrected data, the factorial fit is also markedly higher in the individualistic countries. The match of the corrected data to the ideal Big Five factor structure in these eight countries is notable. In all countries, congruence coefficients exceeded the criterion of .85 suggested by Lorenzo-Seva and Ten Berge (2006).

With regard to the assumed educational bias, the results are not as clear as those for the total samples. Even though we did not find a general educational bias in the sense that low and medium-educated persons have a higher average level and variability in acquiescent

responding (H1), we did find the predicted educational bias for all individualistic countries, as postulated by Hypothesis 5.

The hypothesized educational effects in the factorial fit of the Big Five structures (H3) are also supported by the data. In most countries, the Big Five patterns of the low and medium-educated respondents showed a weaker fit compared to those of the respondents with a high level of education. Here again, we found some support for our cultural-difference hypothesis H5: On average, the educational bias based on the uncorrected factorial structures was slightly higher in the individualistic cultures compared to the non-individualistic cultures.

Finally, the differential effectiveness of the correction for acquiescence (H4) is clearly supported by the data, with low and medium-educated samples benefitting more from the correction than the samples comprising high-educated respondents. All three criteria defined a priori were met.

In sum, we found clear support for our hypotheses. A universal, culture-independent tendency towards individual differences in acquiescent responding that blurs the Big Five factor structures was identified. Therefore, our alternative hypothesis H5, which assumed such an effect primarily for the individualistic countries, can be regarded as too conservative. However, the postulated educational differences do not seem to be universally replicable. On the contrary – as postulated by H5 – they appear to vary with the country's cultural values. For the individualistic countries, we clearly found the hypothesized educational bias, while, in the case of the non-individualistic cultures, the pictures that emerged were less clear.

It might be argued that the distorting effects found in the present study must not necessarily solely be due to acquiescence but might be due to misunderstandings of item content which could be especially pronounced in the lower educated. When looking at the raw score data structure only, this was also our first impression, namely that personality questionnaire items are only understood by the higher educated. We were happy to be able to confute this assumption by showing that controlling for acquiescence diminishes the

educational bias in the factor structures and yields perfectly fitting structures for both educational groups.

Alternatively, one might argue that the better fitting factor structures in higher educated may stem from a more pronounced tendency for social desirable responding in the higher educated. The university-educated respondents might be more likely to endorse the items in a desirable direction, at least compared to less educated respondents who might be relatively naive about such impression management tactics. If this assumption holds, however, we should have found pronounced differences in scale means between high and low/medium educated groups, which we did not (all effect sizes were below .3), but no differences in the mean response across all items as reflected in the acquiescence score, which we did find.

A clear limitation of the present study might be seen in the fact that only an extremely brief Big Five measure was assessed. Consequently, the question must be raised as to what extent the here-found results are generalizable across different Big Five questionnaires and therefore to Big Five assessment in general. Soto's study (Soto et al., 2008) gives first support to this notion. He was able to identify the distorting impact of acquiescence on the Big Five factor structures also based on the full scale BFI, however contrasting children to adults. Based on adult samples varying in their highest education, we could show in a recent study (Rammstedt, 2012) that our here-found results can be clearly replicated also based on a full-scale Big Five measure: Based on the raw score data the Big Five factor pattern could hardly be replicated in the less educated groups. After controlling for acquiescence, however, we found perfectly fitting Big Five factor structures in all subsamples. Thus, it can be assumed that the here-found effects generalize also across different and more detailed Big Five questionnaires.

Our main goal was to investigate whether the distorting impact of acquiescent responding on the Big Five factor structure observed for samples representative of the

German population (Rammstedt et al., 2010; Rammstedt & Kemper, 2011) generalizes across countries. Results of the present study clearly support this assumption. We found a general tendency towards acquiescent responding in all countries; a distorting impact on the Big Five factor structure; and an improvement of fit to the Big Five model after statistically controlling for acquiescence variance.

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Footnotes

¹ Due to the severe time limitations in large-scale surveys like the ISSP, in which each individual's response is counted in monetary equivalents, these surveys are unable to assess full-scale personality scales containing 50 to 250 items.

² France had a lower age cut-off of 15 years; Japan had a lower cut-off of 16 years; and Flanders reported an upper age cut-off of 85 years.

³ Previous studies by Rammstedt et al. (2010, 2011) based their analyses on three educational groups. Results in both studies indicated that the low and medium-educated groups behaved quite similarly and could be clearly differentiated from the high-educated group.

⁴ Results based on Varimax rotation are highly similar to those of the Procrustes rotation for this and for all following factor analyses for the U.S. sample.

Table 1

Sample Composition for the 18 Countries Separately

Country	N	% females	Mean age	% low/medium education
United States	1518	53.4	47.1	48.9
Germany	1701	51.4	49.4	85.4
Ireland	1001	57.8	46.7	65.9
New Zealand	1309	54.0	47.9	51.9
France	1620	54.8	45.3	54.1
Denmark	1598	52.6	46.9	50.3
Switzerland	1078	53.0	49.9	73.3
Flanders	1338	50.5	46.2	70.5
Latvia	1067	59.9	45.3	76.5
Russia	1605	54.5	44.6	39.9
Czech Republic	1226	59.5	45.6	89.6
Israel	1184	51.9	46.3	56.7
Japan	921	53.8	52.7	67.4
Philippines	1200	50.0	41.8	65.7
Mexico	1401	51.6	37.2	83.3
Taiwan	2171	49.1	44.2	63.9
South Korea	1613	54.4	44.6	55.9
Dominican Republic	1958	52.2	37.9	81.9

Table 2

Mean and Variability of the Acquiescence Scores and Percentage of Acquiescent Respondents for the 18 Countries (Total Sample and Each Educational Group)

Country	Individualism	Acquiescence score						% of Low acquiescence (< 2.8)	% of High acquiescence (> 3.2)
		Total		Low/Medium education		High education			
		M	SD	M	SD	M	SD		
United States	3	3.32	.31	3.34	.32	3.30 ^a	.30 ^c	3.0	57.5
Germany	3	3.22	.35	3.23	.35	3.16 ^a	.35	7.5	44.3
Ireland	3	3.31	.31	3.30	.31	3.31	.32	2.0	53.1
New Zealand	3	3.29	.37	3.33	.40	3.26 ^a	.33 ^c	3.9	50.6
France	3	3.24	.45	3.29	.53	3.15 ^a	.34 ^c	7.5	39.3
Denmark	3	3.20	.39	3.24	.42	3.15 ^a	.34 ^c	9.3	39.9
Switzerland	3	3.22	.28	3.23	.29	3.19 ^a	.26	3.3	43.5
Belgium (Flanders)	3	3.15	.32	3.15	.34	3.15	.26 ^c	7.7	33.6

Latvia	2	3.17	.36	3.14	.36	3.26 ^b	.35	11.4	41.0
Russia	2	3.46	.43	3.46	.45	3.46	.43	3.9	69.7
Czech Republic	2	3.16	.38	3.15	.38	3.24 ^b	.37	13.4	39.8
Israel	2	3.52	.38	3.55	.41	3.48 ^a	.35 ^c	2.1	76.9
Japan	2	3.00	.46	3.00	.46	3.00	.47	26.1	27.0
Philippines	1	3.25	.47	3.22	.49	3.30 ^b	.41 ^c	13.3	50.0
Mexico	1	3.55	.49	3.56	.50	3.54	.47	3.4	67.2
Taiwan	1	3.15	.33	3.11	.33	3.21 ^b	.31	9.6	35.8
South Korea	1	3.15	.36	3.14	.39	3.15	.31 ^c	11.4	35.6
Dominican Republic	<i>1</i>	3.45	.36	3.44	.36	3.49 ^b	.36	2.8	70.1
Total Mean		3.27	.38	3.27	.39	3.27	.37	7.9	48.6
Mean (individualistic countries)		3.24	.35	3.26	.37	3.23	.31	5.5	45.2
Mean (non- individualistic countries)		3.29	.40	3.28	.41	3.29	.39	9.7	51.3

Note. Imputed individualism scores are set in italics.

^a Low and medium educated significantly higher mean acquiescent scores compared to high educated ($p < .05$).

^b High educated significantly higher mean acquiescent scores compared to low educated ($p < .05$).

^c Low and medium educated significantly higher standard deviations of the acquiescent scores compared to high educated ($p < .05$).

Table 3

Results for the USA: Procrustes-Rotated Factor Structures of the Raw and Mean-Corrected BFI-10 Items for the Total Sample and for Each Educational Group

I see myself as someone who ...	Total					Low and Medium education					High education				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Raw scores															
... is reserved	.89	.19	-.02	.04	.06	.76	-.25	.37	.06	.00	.88	.20	-.03	-.03	.04
... is outgoing, sociable	-.67	.37	-.01	.19	.21	-.72	.02	.25	.22	.12	-.74	.30	.06	.15	.17
... is generally trusting	-.16	.78	.10	-.10	.19	-.37	.20	.66	-.19	.03	-.15	.79	.10	-.08	.20
... tends to find fault with others	.03	-.30	-.38	-.28	.36	-.10	-.73	-.06	-.23	.12	-.05	-.48	-.21	-.32	.26
... does a thorough job	-.03	.47	.56	.01	.24	-.05	.31	.66	.06	.18	-.09	.42	.65	-.05	.15
... tends to be lazy	-.01	-.01	-.81	-.14	.02	-.18	-.42	-.39	-.23	.01	.01	.11	-.87	-.16	.02
... is relaxed, handles stress well	.04	.21	.00	.80	.13	-.04	-.05	.29	.74	.08	.01	.20	-.03	.81	.11
... gets nervous easily	.19	.02	-.14	-.79	-.04	.12	-.09	.00	-.80	-.07	.18	-.04	-.15	-.79	-.02
... has an active imagination	-.05	.21	-.11	.17	.75	-.17	-.37	.38	.19	.55	-.14	.22	-.08	.07	.73
... has few artistic interests	.10	.38	-.32	.01	-.65	-.05	-.28	.20	.03	-.89	-.01	.28	-.21	-.07	-.73

Factor Congruence	.96	.66	.86	.94	.88	.91	.62	.61	.91	.94	.97	.77	.94	.94	.93
Scores corrected for acquiescence															
... is reserved	.91	.04	.08	.05	-.01	.89	.03	.07	.10	.02	.92	.04	.06	.02	-.02
... is outgoing, sociable	-.75	.16	.15	.22	.12	-.72	.16	.09	.25	.11	-.78	.15	.17	.20	.12
... is generally trusting	-.23	.76	.20	-.11	.13	-.27	.71	.26	-.15	.07	-.18	.77	.18	-.08	.18
... tends to find fault with others	-.11	-.80	-.01	-.28	.12	-.13	-.79	.00	-.32	.09	-.08	-.82	-.01	-.24	.14
... does a thorough job	-.10	.23	.71	.01	.14	-.04	.33	.62	.00	.16	-.13	.19	.76	.01	.11
... tends to be lazy	-.03	.02	-.87	-.17	.04	-.02	.07	-.88	-.20	.06	-.02	.01	-.87	-.15	.01
... is relaxed, handles stress well	.01	.08	.08	.84	.06	.02	.12	.08	.81	.09	-.01	.04	.07	.87	.06
... gets nervous easily	.18	-.08	-.10	-.80	-.09	.16	-.05	-.12	-.77	-.10	.18	-.13	-.09	-.81	-.06
... has an active imagination	-.13	-.07	.06	.23	.70	-.10	-.16	.10	.28	.69	-.18	.00	.05	.15	.70
... has few artistic interests	-.01	-.08	-.03	.07	-.90	.00	-.14	.00	.09	-.91	-.03	-.03	-.05	.04	-.90
Factor Congruence	.95	.96	.96	.92	.96	.95	.92	.94	.89	.96	.96	.97	.97	.95	.96

Note. Loadings $\geq .35$ are set in bold.

Table 4

Total Matrix Factor Congruence Coefficients for the Raw Data and the Data Corrected for Acquiescence Bias for the 18 Countries (Total Sample and Each Educational Group)

Country (Individualism)	Varimax Rotated Structures								Procrustes Rotated Structures							
	Raw data				Corrected data				Raw data				Corrected data			
	Total	L/M. ed.	High ed.	Diff.	Total	L/M. ed.	High ed.	Diff.	Total	L/M ed.	High ed.	Diff.	Total	L/M ed.	High ed.	Diff.
United States (3)	.83	.76	.90	.14	.95	.93	.96	.03	.86	.80	.91	.11	.95	.93	.96	.03
Germany(3)	.83	.82	.82	.00	.95	.95	.94	-.01	.84	.83	.82	-.01	.95	.95	.95	.00
Ireland (3)	.73	.63	.75	.12	.89	.72	.91	.19	.79	.75	.83	.08	.91	.84	.91	.07
New Zealand (3)	.75	.68	.79	.11	.94	.90	.95	.05	.79	.75	.81	.06	.94	.92	.95	.03
France (3)	.79	.70	.83	.13	.87	.85	.87	.02	.82	.79	.84	.05	.88	.86	.88	.02
Denmark (3)	.81	.79	.81	.02	.93	.92	.94	.02	.82	.80	.83	.03	.94	.93	.94	.01
Switzerland (3)	.87	.85	.87	.02	.91	.93	.90	-.03	.87	.85	.88	.03	.92	.93	.92	-.01
Belgium (Flanders; 3)	.78	.73	.87	.14	.95	.94	.95	.01	.79	.79	.88	.09	.95	.94	.95	.01
Latvia (2)	.65	.63	.70	.07	.70	.70	.74	.04	.68	.69	.79	.10	.74	.74	.77	.03
Russia (2)	.63	.62	.64	.02	.89	.85	.88	.03	.72	.70	.75	.05	.91	.89	.90	.01

Czech Republic (2)	.51	.51	.50	-.01	.69	.69	.61	-.08	.62	.62	.61	-.01	.73	.73	.70	-.03
Israel (2)	.60	.65	.68	.03	.83	.73	.70	-.03	.75	.74	.73	-.01	.87	.81	.83	.02
Japan (2)	.67	.66	.68	.02	.83	.80	.67	-.13	.77	.76	.77	.01	.86	.84	.88	.04
Philippines (1)	.48	.44	.52	.08	.63	.56	.68	.12	.58	.55	.63	.08	.70	.69	.72	.03
Mexico (1)	.54	.54	.54	0	.83	.85	.54	-.31	.67	.67	.66	-.01	.87	.87	.76	-.11
Taiwan (1)	.71	.70	.73	.03	.92	.87	.71	-.16	.78	.77	.80	.03	.92	.89	.92	.03
South Korea (1)	.79	.66	.82	.16	.84	.83	.79	-.04	.79	.76	.82	.06	.84	.84	.88	.04
Dominican Republic (1)	.56	.51	.55	.04	.61	.60	.56	-.04	.69	.66	.72	.06	.74	.72	.83	.11
Total Mean	.70	.66	.72	.06	.84	.81	.79	-.02	.76	.74	.78	.04	.87	.85	.88	.01
Mean (individualistic countries)	.80	.75	.83	.08	.92	.89	.93	.04	.82	.80	.85	.05	.93	.91	.93	.02
Mean (non-individualistic countries)	.61	.59	.64	.05	.78	.75	.69	-.06	.71	.69	.73	.03	.82	.80	.82	.01

Note. Imputed individualism scores are set in italics. Factor congruence coefficients equal to or exceeding .85 are set in bold.