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Assessment

MULTICULTURAL VALIDATION OF THE ZUCKERMAN-KUHLMAN-ALUJA PERSONALITY QUESTIONNAIRE SHORTENED FORM (ZKA-PQ/SF) ACROSS 18 CULTURES

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3 **Abstract:** The aim of this study was to assess the psychometric properties of the Zuckerman-Kuhlman-
4 Aluja personality Questionnaire shortened form (ZKA-PQ/SF) in 18 cultures and 13 languages of different
5 African, American, Asian, and European cultures and languages. The results showed that the 5-factor
6 structure with 20 facets replicated well across cultures with a total congruence coefficient of .97. A
7 confirmatory factor analysis (CFA) resulted in adequate fit indices for the 5-factors based on the
8 Comparative Fit Index (CFI), Tucker-Lewis Index (TLI) ($> .90$), and RMSEA (.031-.081). A series of
9 CFA to assess measurement invariance across cultures resulted in adequate CFIs and TLIs for configural
10 and metric invariance. However, factors did not show scalar invariance. Alpha internal consistencies of 5
11 factors ranged between .77 (Sensation Seeking) and .86 (Neuroticism). The average alpha of the 20 facets
12 was .64 with a range from .43 (SS4) to .75 (AG1). Nevertheless, alpha reliabilities were lower in some
13 facets and cultures, especially for Senegal and Togo. The average percentage of the variance explained
14 based on the adjusted R^2 was 2.9%, 1.7% and 5.1% for age, sex and cultures respectively. Finally,
15 multidimensional scaling suggested that geographically or culturally close cultures share mean profile
16 similarities.
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37 **Key words:** ZKA-PQ, ZKA-PQ/SF, factorial invariance, alternative five factor personality model, culture.
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1. INTRODUCTION

This study is a contribution to the knowledge and dissemination of the personality model of Marvin Zuckerman (Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993). The present research assesses the psychometric properties of a shortened version of the Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ; Aluja, Kuhlman & Zuckerman, 2010) in 18 cultures. Additionally we analyzed possible age, sex, culture and national personality differences and similarities. Next, introductory information about the Zuckerman personality model, cross-cultural generalizability and the development procedure of the short form is provided.

1.1. The Zuckerman Five –Factor alternative personality model.

Zuckerman et al. (1993), developed a five-factor personality model formed by Impulsive Sensation Seeking, Aggression–Hostility, Activity, Sociability, and Neuroticism–Anxiety factors, assessed with the Zuckerman–Kuhlman Personality Questionnaire (ZKPQ; see revisions by Zuckerman, 2002 or Zuckerman & Aluja, 2015). This model was developed empirically from successive factor analyses of forty-six selected scales used in research on the biological bases of personality (Zuckerman, Kuhlman, & Camac, 1988; Zuckerman, Kuhlman, Thornquist, & Kiers, 1991). The model was proposed as alternative to the Five Factor Model of personality (FFM), and emphasized the temperamental aspects of personality not considered in the FFM such as Aggressiveness and Sensation Seeking. In contrast to the Openness to Experience of the FFM, an Activity factor, traditionally linked to biological-based temperamental models (Thomas & Chess, 1977; Buss & Plomin, 1975), was also included in the ZKPQ.

The ZKPQ has been adapted in different cultures and languages, the reliabilities of the alternative 5-factor structure replicated well across cultures: China (Wu et al., 2000), Germany (Ostendorf & Angleitner, 1994); Italy (De Pascalis & Russo, 2003); Japan (Shiomi et al., 1996); Spain: Catalan (Gomà-i-Freixanet, Valero, Puntí, & Zuckerman, 2004), Spain: Castilian (Aluja, García, & García, 2002, 2004), and Switzerland French speaking (Rossier, Verardi, Massoudi, & Aluja, 2008). The cross-cultural

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3 generalizability of Zuckerman's alternative five-factor model of personality was demonstrated by a study
4 including data from six different cultures (Rossier et al., 2007). The development of the short form of the
5 ZKPQ adopted a multi-centric/multi-culture approach (ZKPQ-50-CC) and was developed simultaneously
6 in English, French, German, and Spanish (Aluja, Rossier, García, Angleitner, Kuhlman, & Zuckerman,
7 2006). The different language versions all had similar psychometric properties. The ZKPQ scales were
8 very good predictors of the three DSM personality disorder clusters, and in particular of cluster B (Aluja,
9 Cuevas, García, & García, 2007).

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Later Aluja et al. (2010), developed a new instrument inspired by the ZKPQ (89-items), but of 200 items and 20 facets using a Likert-type answer format, called Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ). The five factors are basically the same as those in the ZKPQ, except for some changes produced by the facet's content. The factor of Impulsive Sensation Seeking (ImpSS) is now called Sensation Seeking (SS). This change is due to the fact that the four facets of this factor refer to the Sensation Seeking Scale, form V (Zuckerman, Eysenck, & Eysenck, 1978), and impulsiveness is only presented in six items of the Boredom sensitivity/Impulsiveness facet. The ZKPQ Sociability (Sy) factor was renamed Extraversion (EX) in the ZKA-PQ, as Sociability is one of the facets of this new factor. The ZKA-PQ has a robust factorial structure and adequate internal consistency for the 5 factors and 20 facets, demonstrated in various cultures and languages (Blanch, Aluja & Gallart, 2013; Rossier et al., 2016; Rossier, Hansenne, Baudin, & Morizot, 2012; Surányi & Aluja, 2014). It has also shown adequate convergent and divergent validity with other personality questionnaires (Aluja et al., 2013; Aluja, García, & García, 2002; García, Aluja, García, Escorial, & Blanch, 2012; García, Escorial, García, Blanch, & Aluja, 2012).

1.2. Cross-cultural generalizability of the Zuckerman-Kuhlman-Aluja Personality Questionnaire.

Rossier et al. (2016) studied the replicability of the ZKA-PQ long form in 23 cultures and 17 languages. The ZKA-PQ replicates well across cultures, with congruence coefficients ranging from .94 to

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3 .99, suggesting that this questionnaire can be used in a large diversity of cultures, similar to the Eysenck
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5 personality model (Barrett & Eysenck, 1984; Barrett, Petrides, Eysenck, & Eysenck, 1998; Bowden,
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7 Saklofske, Van de Vijver, Sudarshan, & Eysenck; 2016), or the FFM (Costa, Terracciano, & McCrae,
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9 2001; Hendriks, Perugini, Angleitner, Ostendorf, Johnson, De Fruyt, et al., 2003). Nevertheless, the ZKA-
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11 PQ factor structure and scale internal consistencies were slightly lower for some African and Asian
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13 cultures. Congruence coefficients lower than .80 were detected for the Activity factor in Senegal, for the
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15 Restlessness facet in China, Senegal, and Turkey, and for Impulsivity/Boredom Susceptibility facet in
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17 China and Senegal. The invariance across cultures was assessed by means of multi-group confirmatory
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19 factor analyses and each higher-order personality factor did reach configural and metric invariance, but
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21 scalar invariance was never reached, suggesting that culture specific norms have to be considered. Internal
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23 consistencies, sex differences, and correlations with age were similar across cultures and compatible with
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25 previous studies that used the ZKA-PQ in Spanish (Aluja et al., 2013), French (Rossier et al., 2012) or
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27 Hungarian (Surányi & Aluja, 2014) cultures. The ZKA-PQ and the scoring keys are available for
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29 researchers in Aluja et al. (2010).
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35 Aggressiveness, Sensation Seeking, and Neuroticism correlated negatively with age. Large sex
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37 differences were found for Neuroticism, Sensation Seeking, and to a lesser extent in Activity with men
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39 scoring higher on Sensation Seeking and Activity. Mean scores across cultures were never analyzed using
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41 the ZKA-PQ, because in this study there was no scalar invariance. Nevertheless, several authors have
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43 suggested that too many constraints are considered when assessing measurement invariance, and that this
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45 invariance should be more specifically tested for the latent dimensions. A recent study by Allik and
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47 colleagues (2017), replicating their previous study (Allik & McCrae, 2004) on a larger set of cultures,
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49 analyzed the mean profiles of the Revised NEO Personality Inventory (NEO-PI-R) across 62 different
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51 cultures and observed that differences across cultures are very small but that a meaningful clustering can
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53 be observed. Indeed, countries with similar cultures tend to have similar profiles. For example, Nordic and
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55 English-speaking cultures were characterized by low Neuroticism and high Extraversion whereas, African
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2 cultures were characterized by an inverse profile.
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6 *1.3. Shortened form of the Zuckerman-Kuhlman-Aluja Personality Questionnaire.* 7

8 The ZKA-PQ has 200 items and although it is smaller than other similar personality questionnaires
9 such as the NEO-PI-R or the **Temperament and Character Inventory Revised** (TCI-R) (both 240-items), it
10 is necessary to have a short version for research in circumstances in which the long version is
11 inappropriate. For this reason, Aluja, Lucas, Blanch, García and (2018) developed a short form with the
12 objective of replicating the factorial structure of 5 factors and retaining the 20 facets of the long form.
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15 The shortened form was developed using the following criteria: a) a robust orthogonal factor
16 structure equivalent to the long version structure, b) satisfactory internal consistency for dimensions and
17 facets and good test-retest reliability, c) high correlations between the factors in the long and short form
18 versions, and d) valid relationships with others measures (Aluja et al., 2018). For the development of the
19 short version, five samples were used in order to achieve a structure similar to the long version. A version
20 of 80 items (four items per facet) was obtained and validated in the fifth sample. Most of the items of the
21 short version come from the long version, but 8 were new or have been rewritten (see Aluja et al., 2018;
22 Appendix). The English version of the ZKA-PQ/SF and the scoring keys are available for researchers and
23 for non-commercial use in Aluja et al. (2018).
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41 The ZKA-PQ/SF demonstrates a strong five-factor structure, very similar to the ZKA-PQ long
42 questionnaire with a factor congruence of .98 between both versions. The internal consistency of the 5
43 factors of the ZKA-PQ/SF ranged between .86 and .90, similar to the long version. For facets the alpha
44 reliability ranged between .64 and .86. Only four facets obtained alpha values slightly lower than .70
45 (**Hostility**: .66, **Sociability**: .64, **Dependency**: .69 and **Boredom susceptibility**: .66). Test-retest coefficients
46 for a three-month period were .83, .84, .80, .78, and .82 for Neuroticism, Sensation Seeking, Extraversion,
47 Activity, and Aggressiveness, respectively. Controlling for item overlap, correlations between long and
48 short forms ranged between .65 and .80. Regarding validity, the ZKA-PQ/SF showed acceptable
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2 convergent and divergent validity in relation to the Revised NEO Personality Inventory shortened form
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4 (NEO-FFI-R; Aluja et al., 2018).
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9 *1.4 Purpose of this study*

11 The main objective of this study was to test the structural validity and reliability of ZKA-PQ/SF
12 simultaneously in different cultures. Our aim was to investigate if this shortened form shows similar
13 psychometric properties (factor structure and reliabilities) to the long form, and if those psychometric
14 properties are replicated well across cultures. Additionally, we intended to analyze the impact of age,
15 gender, and culture on personality profiles.
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24 **2. METHOD**

25 *2.1. Participants*

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27 This study was completed by 10,298 participants (5,410 women and 4888 men) from 18 cultures
28 with 13 languages located in Europe (Spain, Catalonia, Germany, Italy, Hungary, Switzerland, Belgium,
29 Bosnia Herzegovina, and Poland), North- and South-America (United States and Chile), Asia (China,
30 Qatar and Israel) and Africa (Tunisia, Senegal, and Togo). The Catalan and the French-, and German-
31 speaking Swiss samples were considered as representing independent cultures in this study. Most of the
32 samples are approximately 50% men and 50% women, except Hungary (65% vs 34.5%), Poland (65.1% vs
33 34.9%) and German-speaking Swiss (61.1% vs 38.9%), all with a majority of women (Table 1).
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45 The mean age was 40.31 ($SD = 17.32$) years for all samples, excluding Senegal. For this culture,
46 only age ranges were reported (18-30 years: 411; 31-45 years: 431; 46-60 years: 384 and > 60 years old:
47 333 subjects). In most cultures, the age distribution was approximately 25% for each age range (18 to 30;
48 31 to 45; 46 to 60, and more than 60 years old), except Togo, China, Poland, and Switzerland (German
49 language), which provided fewer subjects over 60 years of age. Also, China contributed with a somewhat
50 younger sample (18-30: 503, 31-45: 95 and >46 years old: 13). In the total sample, the average age was
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2 39.81 years ($SD = 17.37$) for women and 40.87 years ($SD = 17.41$) for men. Although the age difference
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4 for gender was statistically significant ($t(1) = 2.83, p < .005$), the effect size was negligible (Cohen's $d = -$
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6 0.12).
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10 2.2. Measure.

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12 The Zuckerman-Kuhlman-Aluja Personality Questionnaire shortened form (ZKA/SF-PQ; Aluja et
13 al., 2018) is an 80-item version derived from the 200 item ZKA-PQ long form (Aluja et al., 2010). Both
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15 the ZKA-PQ and the ZKA-PQ/SF have 20 facets and five factors. The shortened form has 4 items per facet
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17 while the long form has 10 items per facet (Aluja et al., 2018). Both questionnaires has five main factors:
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19 Aggressiveness (AG), Activity (AC), Extraversion (EX), Neuroticism (NE), and Sensation Seeking (SS).
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21 Validity and reliability of the ZKA-PQ were demonstrated in the original study (Aluja et al., 2010) as well
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23 as a follow up study with 23 cultures and languages (Rossier et al., 2016). Each main factor is divided in 4
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25 facets assessed by 40 items for the long form and 16 for the short form. The four facets by factor are the
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27 following: AG includes Physical Aggression (AG1), Verbal Aggression (AG2), Anger (AG3), and
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29 Hostility (AG4). AC is divided into Work Compulsion (AC1), General Activity (AC2), Restlessness
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31 (AC3), and Work Energy (AC4). EX is divided into Positive Emotions (EX1), Social Warmth (EX2),
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33 Exhibitionism (EX3), and Sociability (EX4). NE is divided into Anxiety (NE1), Depression (NE2),
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35 Dependency (NE3), and Low self-esteem (NE4). Finally, SS is divided into Thrill and Adventure Seeking
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37 (SS1), Experience Seeking (SS2), Disinhibition (SS3), and Boredom Susceptibility/Impulsivity (SS4). The
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39 response format is a 4-point Likert-type scale ranging from *strongly disagree* (1) to *strongly agree* (4) in
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41 both formats.
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51 2.3. Procedure.

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53 The first author of this study invited the researchers from 23 cultures that participated in the study
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55 by Rossier et al. (2016) to contribute to the present study. Researchers from the following cultures
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2 answered positively to this invitation: Belgium, Bosnia-Herzegovina, Catalonia, Chile, China, Germany,
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4 Hungary, Israel, Italy, Poland, Senegal, Spain, Switzerland, Tunisia, Turkey and United States. In addition,
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6 researchers from Qatar, Togo, and German-speaking Switzerland also agreed to participate.
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10 Researchers were able to use the items of the long form of the ZKA-PQ translated previously in the
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12 study by Rossier et al. (2016). As it has been mentioned previously, the ZKA-PQ/SF has 80 items, of
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14 which 72 come from the long version. The researchers had to translate the remaining 8 new items from
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16 English into their mother tongue, and translate them back into English by an independent translator. Both
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18 versions in English, the original and the back-translated version were analyzed and discrepancies were
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20 resolved until both English versions were equivalent, according to the procedure used in the article by
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22 Rossier et al. (2016), and also described in detail in Blanch and Aluja (2016).
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26 The ZKA-PQ/SF and two additional questionnaires, which are not used in the present study, were
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28 filled in by adult volunteers (except USA sample) of both genders using the snowball method. For this, we
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30 did benefit from the help of undergraduate students who received credits for their personality psychology
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32 class. Each student was instructed to administer the questionnaire in paper and pencil form to 8 subjects, 4
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34 men and 4 women of the community with a following age range: a) 18 to 30 years, b) 31 to 45 years, c) 46
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36 to 60 years and d) more than 60 years old. Approximately 400 participants from each culture (50% of each
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38 gender) was a target goal. In the United States sample, participants were recruited and paid through
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40 Amazon's Mechanical Turk crowd sourcing platform using the same age and gender criteria as the other
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42 samples.
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47 48 *2.4. Statistical Analyses.*

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50 To analyze the structure of the ZKA-PQ/SF, a factor analysis (principal axis extraction and
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52 Varimax rotation method) of the 20 facets was carried out for the whole sample. Subsequently, a
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54 Procrustes matrix (McCrae, Zonderman, Costa, Bond, & Paunonen, 1996), with orthogonal rotation was
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56 obtained in reference to the factorial matrix of the original ZKA-PQ (Aluja et al., 2010) and original ZKA-
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2 PQ/SF (Aluja et al., 2018). Factorial congruence coefficients were calculated between the complete matrix
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4 of ZKA-PQ/SF and the ZKA-PQ and ZKA-PQ/SF original Spanish matrices (Aluja et al., 2010; Aluja et
5
6 al., 2018). Also, congruence coefficients (CCs) were calculated using each one of the 18 factor matrices
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8 (one by culture). CCs higher than .90 indicated a high structural equivalence, CCs ranging from 0.81 to .90
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10 indicated a borderline structural equivalence, and CCs equal or below .80 indicated a poor structural
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12 equivalence. Additionally, we calculated the correlations between the means of the study by Rossier et al
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14 (2016) with this study (long and short version of the ZKA-PQ).
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18 To analyze the level of invariance across cultures, we used multiple-group structural equation
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20 modelling for each factor successively using parcels as observed variables. This is the same procedure
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22 used by Rossier et al. (2016), and we have retained it since we are interested in comparing the present
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24 results with those obtained for the long version of the ZKA-PQ. First, we verified the adequacy of each
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26 factor's structure including four facets. Each facet was defined as a latent variable of two parcels using a
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28 systematic algorithm (Coffman & MacCallum, 2005; Little, Cunningham, Shahar, & Widaman, 2002).
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32 In order to assess model-fit, various goodness-of-fit indices were considered; χ^2 per degree of
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34 freedom (χ^2/df), the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean square
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36 error of approximation (RMSEA). A χ^2/df below 5 reflects an acceptable model fit (Bollen, 1989). A
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38 RMSEA equal to or lower than .05 reflects good fit, and values between .05 and .08 indicate an acceptable
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40 fit (Browne & Cudeck, 1992). CFI and TLI values above .95 indicate a good fit, while values ranging from
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42 .90 to .95 are considered acceptable (Byrne, 2010). Along with the overall fit of each model, changes in
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44 model fit statistics were also inspected, in order to analyze configural, metric, and scalar invariance.
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46 Change in the CFI should be less than .01 (Byrne & van de Vijver, 2010; Cheung & Rensvold, 2002) and
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48 some authors have used $\Delta RMSEA < .05$, although no cut-off was provided (e.g., Savickas & Porfeli,
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50 2012).
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55 Means, standard deviations and internal consistency were calculated for all factors and facets for
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2 both genders. Internal consistency of the five factors in all cultures was obtained analyzing Cronbach's
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4 alpha. In addition, we used a GLM multivariate analysis for each culture to obtain partial correlations with
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6 age, controlling for gender, and gender differences for each personality factor, controlling for age. When
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8 age was used as a variable or covariate, the age range was used to obtain the information from Senegal. For
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10 this culture, values for the age variable were created according to the following recodification of the age
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12 range: 18 to 30 = 1; 31 to 45 = 2; 46 to 60 = 3, and more than 60 years old = 4. Note that the correlation
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14 between age and age range was .97 for the whole sample. Last, we show the personality differences
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16 between cultures plotted onto dimensional graphic coordinate grids, which map out the size and the
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18 relative position of respective standardized factor personality levels. Differences and similarities between
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20 cultures were analyzed using a multivariate GLM analysis of the 5-ZKA-PQ/SF factors controlling for age
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22 and sex. For the graphical analyzes, z-scores were used in reference to the mean and standard deviation of
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24 the whole sample.
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30 Finally, multidimensional scaling (MDS; Kruskal & Wish, 1978) analyses were performed with
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32 ordinal proximity transformations and Euclidian distance measures on the 20 facets' normalized scores in
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34 order to represent the distance between cultures. When the coefficient of alienation or stress measure is
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36 smaller than .15, a two-dimensional space appears usually to be the most interpretable solution (Borg &
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38 Lingo, 1987).
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43 3. RESULTS

44 3.1. Replicability of the ZKA-PQ/SF factor structure in 18 cultures.

45 A principal axis factor analysis with Varimax rotation on the 20 facet-scales for the total sample
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47 ($N = 10,298$) was performed. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was .84. Bartlett's
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49 Test of Sphericity was 63,741.77 (190 degrees of freedom; $p < .001$). We extracted five factors which
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51 explained 60.24% of the variance (6.36% to 21.12%) using the same procedure included in the original
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53 validation of the ZKA-PQ/SF (Aluja et al., 2018). Eigenvalues were 4.22, 3.30, 1.85, 1.40., 1.27 and 0.85
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2 for the sixth factor. The variance explained by the 5 factors ranged between 55.66% (Senegal) and 70.62%
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4 (USA). All facets loaded on their respective factor with loadings greater than .40 except for Bosnia
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6 Herzegovina (EX2: .39), China (AC3: .24, EX2: .37), Poland (AC3: .29), Qatar (AC3: .12, SS4: .37),
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8 Senegal (AC3: .29, EX2: .29, SS2: .25), Switzerland (F) (EX3: .21), Togo (EX2: .30, SS2: .33, SS4: .18),
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10 and Tunisia (AC3: .10, EX2: .37, SS4: .39).
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14 Later, we compared the ZKA-PQ/SF factor structure obtained in the current study with the original
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16 ZKA-PQ (Aluja et al., 2010) and the original ZKA-PQ/SF (Aluja et al., 2018). A Procrustes rotation
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18 towards the Varimax structures of the original samples is reported on Table 2. Note that both rotated
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20 solutions for the total sample (considering the 18 cultures) are highly congruent at trait and facet levels.
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22 This strong congruence is observed for both long and short form original Spanish solutions.
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25 26 27 28 *3.1.1. Cross-cultural similarities between the long and short ZKA-PQ versions.*

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30 To obtain a quantitative evaluation of whether differences on country mean scores replicate across
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32 samples and instruments, we correlate the mean scores obtained in the present sample with those reported
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34 by Rossier et al. (2016) for the long version of ZKA-PQ with different samples. Since the correlations
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36 were based on 15 cases only (15 countries were analyzed in both studies), non-parametric Spearman
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38 correlations were computed for every trait (r coefficients between parenthesis): Aggressiveness (.45),
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40 Activity (.81), Extraversion (.80), Neuroticism (.69), and Sensation Seeking (.30). Note that all coefficients
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42 were positive, although correlations for Aggressiveness and Sensation Seeking were non-significant ($p >$
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44 $.05$). This analysis supports the stability of cultural pattern across instruments and samples, although the
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46 effect is weaker for two traits (Aggressiveness and Sensation Seeking).
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50 51 52 *3.2. Congruence coefficients for every culture and personality factor.*

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54 When factor structures were compared by culture, all 5 factors of the ZKA-PQ/SF obtained CCs
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56 above .90 except in Qatar (AC: .88), Senegal (EX: .89, NE: .89 and SS: .84), Togo (SS: .83) and Tunisia
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(AC: .86) in relation to the original ZKA-PQ. In relation to the original ZKA-PQ/SF, only Senegal (EX: .88 and SS: .85) and Togo (SS: .86) obtained CCs lower than .90 (Table 3). Note that only 6 of 90 factors (5 for 18 cultures) for the long version, and 3 of 90 for the short version cannot be considered equivalent. Therefore, in accordance with the .90 cut-off criteria, factor structures of the ZKA-PQ/SF were highly equivalent to the structures of the original Spanish ZKA-PQ and ZKA-PQ/SF versions across all cultures.

3.3. *Internal consistency of factors and facets by culture.*

Internal consistency of the five ZKA-PQ/SF domain scales was analyzed using Cronbach's alpha (Table 4). The average alphas by factors across samples were: Neuroticism (.86), Aggressiveness (.85), Extroversion (.81), Activity (.79), and Sensation Seeking (.77). All factors obtained alpha of .70 or higher except Senegal (AC: .66, EX: .56 and SS: .56) and Togo (SS: .57). Appendix (A-1) shows the means, standard deviations, and internal consistency for the 5 factors and 20 facets of the ZKA-PQ/SF for men and women in all cultures. The average alpha of the 20 facets was .64 with a range of .75 (AG1) to .43 (SS4). Note that although facets are formed by four items only, SS4 is the only facet with an alpha average below .50. Reliability indexes for all facets by culture and sex are reported in Appendix section (A-1 to A-6). Senegal and Togo presented the highest number of facets with reliability indexes below .50.

3.4. *Invariance across cultures.*

The structure for each factor in the total sample was assessed with a confirmatory factor analysis resulting in adequate fit indices; except that the χ^2/df that was too high, which may be due to the very large total sample size ($N = 10,298$). Complete results of this analysis are presented in the Supplementary Material-1 file (S-1). The overall structure of each factor was supported by the following fit indices: Aggressiveness, $\chi^2/df = 19.47$, CFI = .988, TLI = .978, RMSEA = .042; Activity, $\chi^2/df = 68.32$, CFI = .946, TLI = .905, RMSEA = .081; Extraversion, $\chi^2/df = 40.32$, CFI = .971, TLI = .949, RMSEA = .062; Neuroticism, $\chi^2/df = 44.94$, CFI = .974, TLI = .955, RMSEA = .065; Sensation Seeking, $\chi^2/df = 10.92$,

CFI = .990, TLI = .983, RMSEA = .031. The level of invariance was assessed using multi-group confirmatory factor analyses. All CFIs and TLIs for configural and metric invariance indicate an adequate fit, except TLIs for Activity that were slightly below .90. Values were below the threshold for scalar invariance for each domain ($CFI \leq .841$ and $TLI \leq .837$). In all cases, the RMSEA was very low ($\leq .041$). The χ^2/df for the configural and metric invariance was below 5 for four out of the five dimensions and slightly higher than 5 for Activity ($\chi^2/df \leq 5.94$). Scalar invariance analyses always yielded high χ^2/df values. Changes in the CFIs and TLIs between configural and metric invariance was below .01 for Activity, Extraversion, and Neuroticism and very close to this value for Aggressiveness and Sensation Seeking ($\leq .018$). Changes in RMSEAs between configural and metric invariance were always far below .05. On the other hand, most fit values for scalar invariance were inadequate ($\chi^2/df \geq 9.63$, $CFI \leq .841$, $TLI \leq .837$), only RMSEA values were adequate. Changes in CFI and TLI values between metric and scalar invariance were all very high ($\geq .118$). Changes in χ^2 were also all very high (≥ 3750.14) and very significant. The different factors of the revised Zuckerman's Alternative Five Factor Model seem to reach configural and metric invariance but not scalar invariance.

The fact that the five main dimensions do not reach scalar invariance seems to suggest that items (in the present analysis using parcels of two items) do function slightly differently from one culture to other. However, bias at the item level could cancel out at the facet level. For this reason, we also assessed the measurement invariance across cultures of all dimensions at once considering facets (including all four items) as the observed variables. Results were as follows: Configural ($\chi^2/df = 6.25$, $CFI = .784$, $TLI = .744$, $RMSEA = .022$), metric ($\chi^2/df = 6.11$, $CFI = .767$, $TLI = .745$, $RMSEA = .022$), and scalar ($\chi^2/df = 9.49$, $CFI = .570$, $TLI = .577$, $RMSEA = .029$) invariances. Note that all fit indexes are poor except the RMSEA, but these indices were similar to those observed by Aluja et al. (2010) and Rossier et al. (2016). Note that changes in the CFIs, TLIs, and RMSEAs were small between configural and metric invariance, but larger between metric and scalar invariance, suggesting again that the scales of the ZKA-PQ-SF do not reach scalar invariance and that the possible differential item functioning did not cancel out at the facet level.

3.5. Effect of age and gender

Partial correlations were carried out controlling for gender to analyze the relationship between the five personality factors and age for each culture. As can be seen in the Supplementary Material-1 file (S-2). Sensation Seeking (-.28), Aggressiveness (-.16), Neuroticism (-.13), and to a lesser extent Extraversion (-.05) were correlated negatively with age. In contrast, Activity tended to correlate positively with age (.07). However, in some cultures such as Bosnia-Herzegovina, Chile, or China there were no negative relationships for age with Aggression or Sensation Seeking. In addition, we performed a GLM multivariate analysis comparing the scores of the personality factors with gender controlling for age. Men tend to be more aggressive and sensation seeking than women, whom are higher on Neuroticism. Neuroticism and Sensation Seeking obtain the largest effect sizes, although these differences are somewhat inconsistent across cultures. Gender differences¹ for Neuroticism were associated with a medium effect size in Belgium ($\eta^2 = .069$), Germany ($\eta^2 = .064$), Hungary ($\eta^2 = .063$), Italy ($\eta^2 = .068$) and French-speaking Switzerland ($\eta^2 = .093$). For Sensation Seeking the strongest differences were in Belgium ($\eta^2 = .113$), Germany ($\eta^2 = .061$), Israel ($\eta^2 = .074$), Italy ($\eta^2 = .071$) and French-speaking Switzerland ($\eta^2 = .092$). Table S-3 of the Supplementary Material-1 file shows the R^2 for regression analyses considering age and sex as independent variables and the five factors as dependent variables for each culture. The average percent of variance accounted for by age was 2.9% and by sex was 1.7%. The age range was between 0% and 24% and sex range was between 0% and 9%.

Figure 1 shows a graph comparing means of four age groups (18-30, 31-45, 46-60 and more than 60 years) for each ZKA-PQ/SF factor using the whole sample. Figure 1 also displays another graph comparing gender differences (t -test) of the five personality domains for men and women at the four different age levels in personality factors, using the entire sample. At each of the four age groups, men and

¹ η^2 : .000 to .003 = d : .0 to .1 (no effect); η^2 : .010 to .039 = d : .2 to .4 (small effect); η^2 : .060 to .119 = d : .5 to .07 (intermediate effect); η^2 : .140 to .200 = d : .8 to ≥ 1 (large effect) (Cohen, 1988). For reasons of clarity the eta squared can be transformed into Cohen d .

women differ most clearly in the factors Neuroticism and Sensation Seeking. The results clearly show that the scores in Sensation Seeking, Aggressiveness and, to a lesser extent Extraversion, decreased with age. Neuroticism declines with age, but for participants over the age of 60 it goes back up a little, whereas Activity rises after 30 years and stays the same. Aggressiveness is greater in men starting at 46 years of age. Women score higher in Activity in the group of 18 to 30 years but tend to score lower after 60 years.

3.6. National differences.

We examined the personality differences across cultures using a GLM Multivariate procedure for the 5-ZKA-PQ/SF factors controlling for age and sex. A test of between-subjects effects based in a corrected model informs us that the scores for all five factors are significantly different between cultures ($p < .001$). Nevertheless, considering the effect size, only Activity ($\eta^2 = .121$) and Sensation Seeking ($\eta^2 = .112$) were significant according to Cohen (1988). Extraversion ($\eta^2 = .056$), Neuroticism ($\eta^2 = .054$) and Aggressiveness ($\eta^2 = .031$) obtained small effect sizes. Additionally, the effects were analyzed separately for age, sex, and culture. Significant effects of age on personality were found for Sensation Seeking ($\eta^2 = .068$), for sex there were no significant differences, and for culture only Activity ($\eta^2 = .117$) obtain a large effect size. The average percentage of the variance explained based on the adjusted R^2 was 2.9%, 1.7% and 5.1% for age, sex and culture respectively. These results support the called “Similarities Hypothesis”, defined as “*personality traits being similar in structure and sex differences across countries, as well as in aggregate country levels*” (Kajonius & Giolla, 2017).

To provide an illustration of cultural comparisons, each culture has been plotted in a series of graphs in Supplementary Material-2. There is a scatterplot for each possible pairing of two factors of the ZKA-PQ/SF, with one factor on each axis. In each scatterplot, all 18 cultures are plotted based on their z-scores in reference to the means and standard deviations of the full sample, controlling age and sex. A similar procedure was proposed by Kajonius (2017). The observed range of differences is small, ranging between approximately $\pm .50 SD$. The cultures that are in the most **detached or separated** position were a)

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2 NE/EX: China would be placed in the NE+/EX- quadrant, while the USA would be placed in NE-/EX-; b)
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4 EX-AC: USA and China in EX-/AC-, Germany and German-speaking Switzerland EX+/AC-, and Senegal
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6 EX-/AC+; c) AC/SS: Tunisia and Senegal in SS+/AC+, and Germany, China, and USA in SS-/AC-; d)
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8 EX/AG: USA and China in EX-/AG+--; e) SS/EX: USA and China SS-/EX-; f) NE/AG: Chile NE-/AG-;
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10 g): AG/SS: Tunisia in AG+/SS+, Chile in AG-/SS+, and Israel and German-speaking Switzerland in AG-
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12 /SS-; h) NE/SS: Tunisia in NE+/SS+, China in NE+/SS-, and USA in NE-/SS-; i) AG/AC: Senegal in
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14 AG+/AC+, USA and Belgium in AG+/AC-, Germany in AG-/AC-; j) NE/AC: Senegal, Togo, and Tunisia
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16 in NE+/AC+, Germany in NE-/AC-.

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21 For each individual ZKA-PQ/SF factor, z-standardized personality factors between cultures were
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23 plotted in the Figure 2. The cultures near or that slightly exceeding ± 0.5 were China (EX-), Senegal (AC+),
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25 Tunisia (SS+) and USA (AC-, EX-, SS-). We also analyzed the proximity of the culture profiles by
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27 performing a multidimensional scaling analysis considering culture mean standardized profiles on the 20
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29 facet scales that resulted in an acceptable coefficient of alienation of .04 and a Tucker's coefficient of
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31 congruence of .98. The first dimension is strongly associated with AC ($\rho = -.84$) and SS ($\rho = .78$), and
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33 the second dimension is strongly positively associated with NE ($\rho = .77$) and AG ($\rho = .67$) and
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35 negatively with EX ($\rho = -.79$). Figure 3 shows the multidimensional scaling plot, note that cultures that
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37 are close in terms of cultural distance also tend to be in close proximity in the figure. For example, Senegal
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39 is plotted near to Togo, and Tunisia is near Qatar on the right side of the quadrant (high AC/SS). Similarly,
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41 European cultures tend to be near the center of the scatterplot, while China and the USA show a certain
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43 degree of separation. This analysis seems to confirm that cultural similarity maps on to mean score
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45 personality profiles.
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51 52 DISCUSSION

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54 This study was designed with the main objective to test the validity and reliability of a short version
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56 of the ZKA-PQ in different cultures. Online and mobile assessment capabilities including the use of smart
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2 phones, tablets and other handheld devices has accentuated the demand for short forms (Arthur,
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4 Doverspike, Muñoz, Taylor, & Carr, 2014). However, compared to the longer test, a shorter test version
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6 may have a substantial impact on the reliability and the validity of the test scores in psychological research
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8 and individual decision making (Kruyen, Emons, & Sijtsma, 2013). Despite this, the original form of the
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10 ZKA-PQ/SF showed comparable psychometric properties (factorial structure and good factors and facets
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12 reliability) comparable to the long form (Aluja et al., 2018).
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16 In the Rossier et al. (2016) multicultural study, the ZKA-PQ factorial structure replicated well in all
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18 cultures, with factors even reaching metric invariance. However, in some cultures internal consistencies for
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20 facets were slightly lower. The reliability was particularly low for Restlessness in Senegal and Togo, and
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22 for Boredom Susceptibility/Impulsiveness in China and Senegal. Similar problems in these cultures were
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24 previously reported in studies using the Five-Factor Personality Model (McCrae et al., 2005, Zecca et al.,
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26 2013). Some authors have suggested that in more collectivistic societies, personality descriptions in terms
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28 of traits could be socially less relevant (Rossier et al., 2017). Some factors, such as low personality
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30 descriptive relevance of some of the items, low reading skills, and low verbal comprehension may
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32 introduce noise (lower the reliability). In addition, if such effects were correlated across cultures they may
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34 also explain similarity in specific cultures (e. g., Qatar, Tunisia, Senegal, and Togo). These lower
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36 reliabilities could lead to some difficulties when analyzing the factor structure. In the present study the
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38 structure and reliability of the ZKA-PQ/SF was similar to the long version with some exceptions.
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44 The current results of the ZKA-PQ/SF factorial congruence coefficients compared to the original
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46 ZKA-PQ/SF were excellent when considering the whole sample. The same can be said for almost all
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48 cultures and traits analysed. Also, reliability measured by the average internal consistency ranged between
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50 .77 and .86 for the five factors. Again, with some exceptions the reliability indexes of traits and facets are
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52 adequate. An exception is the SS4 facet that presents lower alpha coefficients in many cultures (average of
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54 .44). Note that this facet lost the impulsivity items in the successive factor analyses performed in the
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56 original Spanish version (Aluja et al., 2018), and the content is now exclusively Boredom Susceptibility
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2 items. In the Sensation Seeking Scales form V (Zuckerman, Eysenck, & Eysenck, 1978), Boredom
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4 Susceptibility always had a low alpha with 10 items, particularly for women (Zuckerman, 1994, p. 32).
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6 Notwithstanding the low alpha in some facets for Senegal, Togo, and to a lesser extent Tunisia or China
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8 the current results coincide with the results obtained in Rossier et al. (2016). According to Rossier,
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10 Ouedraogo and Dahourou (2017) and Zecca et al. (2013), internal consistencies tend to be lower in
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12 collectivistic compared to individualistic cultures, and cultures in the current study such as Senegal, Togo,
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14 Tunisia or China are considered as collectivistic. The problems found in Senegal and Togo may be also
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16 due to the fact that, as Rossier et al. (2016) have previously pointed out, the questionnaire was
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18 administered in the French language, which despite being an official language in these two cultures, is not
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20 their mother tongue.
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25 For the purpose of examining measurement invariance in the ZKA-PQ/SF, which is the degree of
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27 scale equivalence between cultures, we conducted a series of multi-group confirmatory factor analysis. The
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29 results confirmed that five factors reached configural and metric equivalence, suggesting that each factor
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31 and its facets assessed the same construct across cultures. Scalar invariance was unsatisfactory. Our results
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33 are similar (although somewhat weaker) to those obtained in the previous study with the long form of the
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35 ZKA-PQ in 23 cultures (Rossier et al., 2016). So, the global results of the present study suggest that the
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37 factor structure of the short form of the ZKA-PQ replicates well in all cultures, with the minor exception of
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39 Senegal.
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44 As in the present study, Rossier et al. (2016) observed that the scales in the long version of the
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46 ZKA-PQ did not reach scalar invariance. Therefore, they decided not to compare mean personality profiles
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48 across cultures. Indeed, scalar invariance is necessary in order to compare mean scores across cultures
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50 according to some methodologists (van de Vijver & Leung 2011). However, some researchers have argued
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52 that the requirement for scalar equivalence is too strict and that the constraints should only be considered at
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54 the level of facets or factors, suggesting that the bias at the item level could be canceled out (Allik &
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56 McCrae, 2004). Accordingly, some methodologists have proposed less strict approaches to test
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2 measurement invariance (Millsap, 2011). Nevertheless, the geography of personality profiles across
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4 cultures is difficult to replicate using different instruments. Indeed, Rossier et al., (2007) were unable to
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6 replicate some properties of this geography using the ZKA-PQ. Because ZKA-PQ/SF Neuroticism and
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8 Extraversion factors are highly equivalent to the NEO-PI-R factors of the same name (Abad, Sorrel,
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10 García, & Aluja, 2016) it may be possible to assess the stability of the cultural classification reported by
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12 Allik et al. (2017) for at least some cultures. It would be highly interesting to see if the differences between
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14 cultures generalize across instruments and samples. The T-scores for the NEO-PI-R are listed in the
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16 Appendix of Allik et al. (2017). A positive correlation between the long and short ZKA-PQ versions would
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18 support the stability of the pattern of cultural differences reported. This fact calls for replicating these
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23 results in future studies.

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25 Analyzing personality traits across different cultures, we found some patterns that are similar to
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27 those observed by Allik et al. (2017). For example, in both studies, China exhibited high Neuroticism and
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29 low Extraversion. However, in the Kajonius (2017) study Germany and China showed both low
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31 Neuroticism and low Extraversion. What seems to be most evident in the study by Allik et al. (2016) is that
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33 similar cultures (separated by a low cultural distance) seem to have similar mean personality profiles. This
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35 was also the case in the present study. For example, German and German-speaking Swiss had similar
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37 profiles, as did the African cultures. European cultures seemed to be situated in the middle of the graph,
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39 African cultures are on the right side of the graph (high Activity and Sensation Seeking), the USA is on the
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41 left side of the graph (low Activity and Sensation Seeking), China is on the upper side of the graph (high
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43 Neuroticism low Extraversion), and Chile on the lower side of the graph (low Neuroticism and high
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45 Extraversion). It is possible that mean scores in the USA sample may reflect differences in the sampling
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47 method rather than cultural differences. The differences found in our US sample are consistent with some
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49 prior research suggesting substantial personality differences between Mturk and community samples. For
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51 example, Goodman, Cryder, & Cheema (2013) found that MTurk participants are less extraverted and have
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53 lower self-esteem than other participants, presenting challenges for some research domains. In this line,
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2 recently, **McCredie and Morey (in press)** have reported that MTurk workers scored higher negative affect
3 and lower social engagement.
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6 Sex, age, and culture did not play a main role in regard to personality differences in Zuckerman's
7 alternative model of personality and this is consistent with our results. The percentage of variance
8 accounted for by these variables is somewhat negligible with averages of 2.9% for age, 1.7% for sex and
9 5.1% for culture. Kajonius and Giolla (2017) obtained similar results using a measure of the Five Factor
10 Model (FFM) (IPIP-NEO-120). We considered the results as supportive of a Similarities Hypothesis if
11 differences in these variables accounted for around or less than 5% of the variance. So, it seems that sex
12 and age cannot account for the trait differences. This pattern is observed for the majority of the cultures.
13 So, gender differences are small relative to individual variation within genders replicating a well-known
14 pattern observed in most personality instruments across cultures (for instance, NEO-PI-R; Costa et al.,
15 2001). Relating to this point, the effect sizes associated with sex-differences were globally closer
16 compared to the effect sizes for age-differences, similarly to Rossier et al. (2016) with the ZKA-PQ.
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32 These profiles could be quite sensitive to some sampling or language bias and the number of
33 cultures should ideally be larger with more cultures or cultures of underrepresented continents, such as
34 Latin America. However, the impact of the cultural context on the personality development is certainly a
35 very interesting and promising topic. This could also be studied at the individual level. Indeed, each person
36 is in a slightly different context and has a subjective perception of it. So, further studies could take into
37 account more systematically the specific cultural context of people in order to analyze the relationship
38 between this context, its objective and subjective components, and the individual's personality
39 development.
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50 This study has several limitations. The samples are not representative of the cultures. However,
51 collaborating researchers were instructed to provide data with equally sized sex and age groups between 18
52 and more of 60 years. This was not achieved in some cultures. All data was obtained through paper and
53 pencil and invitations to volunteer community participants, except in the USA, which was obtained
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2 through Mturk. As mentioned, some differences found in the American sample could be due to this
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4 procedure. Therefore these results should be taken with caution. Another limitation is the less adequate
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6 psychometric properties of the ZKA-PQ/SF in some cultures and traits, especially in Senegal and Togo. As
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8 it has been mentioned above, the questionnaires were not written in their mother tongue in both cultures.
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10 The problems with researching some of these cultures have already been reported previously in other
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12 studies, so we should be cautious with these results (Rossier et al., 2016).
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16 Summing up, results of the present study confirmed the use of the short version of the ZKA-PQ for
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18 research in sampled cultures, although the norms and characteristics of each culture should be considered.
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20 Note that psychometric properties of the ZKA-PQ/SF have been strongly replicated in 18 cultures and 13
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22 languages and the global results show a good factorial structure based on 20 facets and 5 factors. These
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24 results are highly similar to the original version of the ZKA-PQ. Confirmatory factor analysis support the
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26 configural and metric invariance but not scalar invariance of the ZKA-PQ/SF. These data replicate the
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28 pattern observed with the long version (Rossier et al., 2016). For Senegal and Togo, it would be interesting
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30 to replicate this study using the mother tongue of both peoples. For the factors of the ZKA-PQ/SF, mean
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32 differences across cultures were not sharp, as small effect sizes suggest, although certain differential
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34 patterns can be observed. The effect of age, sex and culture was similar to that found in recent studies with
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36 measures of the Five Factor personality model. A multidimensional scaling suggested that geographically
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38 or culturally proximate cultures share similar mean personality profiles.
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FIGURES

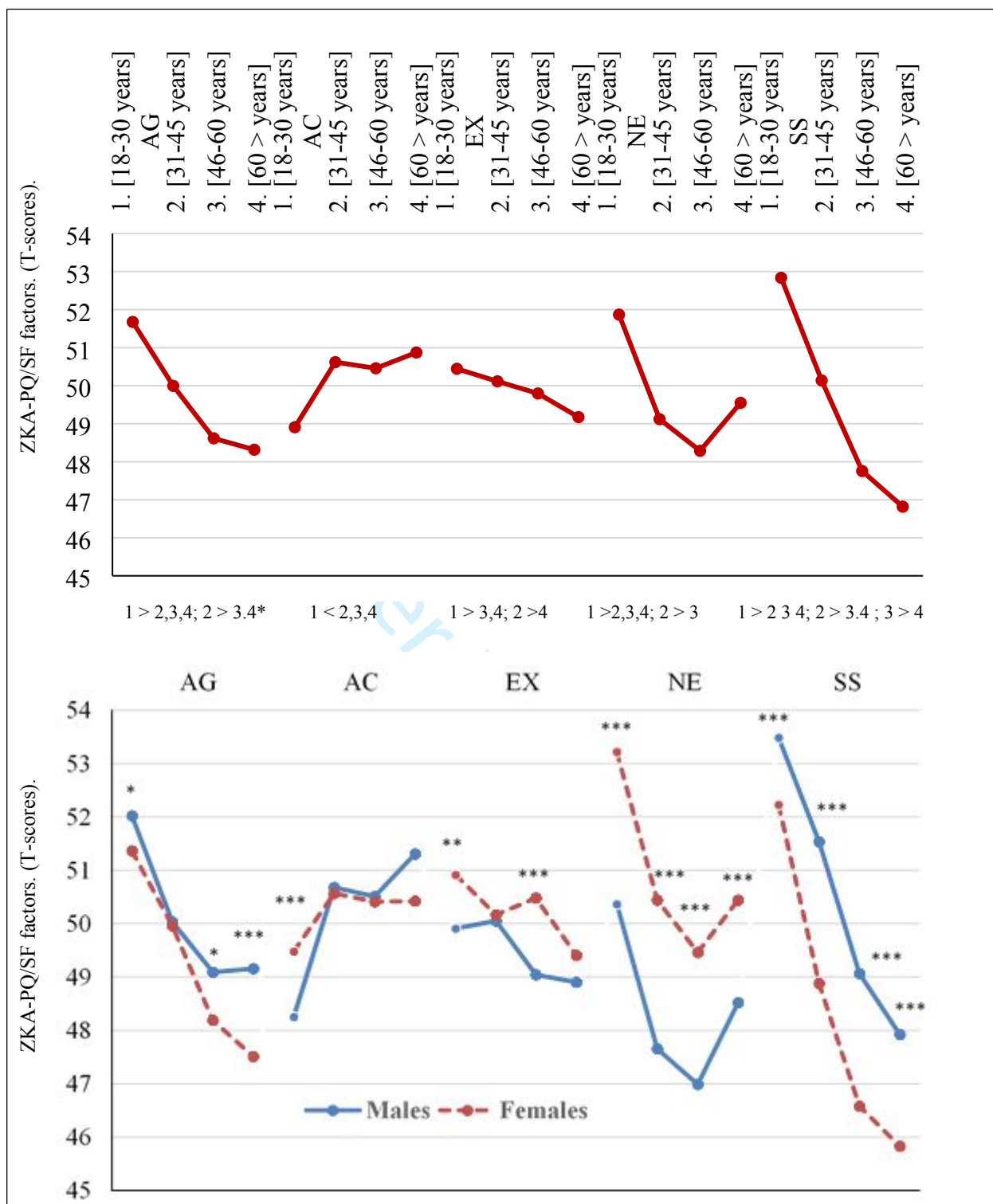


Figure 1. Differences between age groups in ZKA-PQ/SF considering all cultures (above) (*Scheffe comparisons: $p < 0.05$), and sex differences by age groups in ZKA-PQ/SF considering all cultures (below). * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$). AG = Aggressiveness; AC = Activity; EX = Extraversion; NE = Neuroticism; SS = Sensation Seeking.

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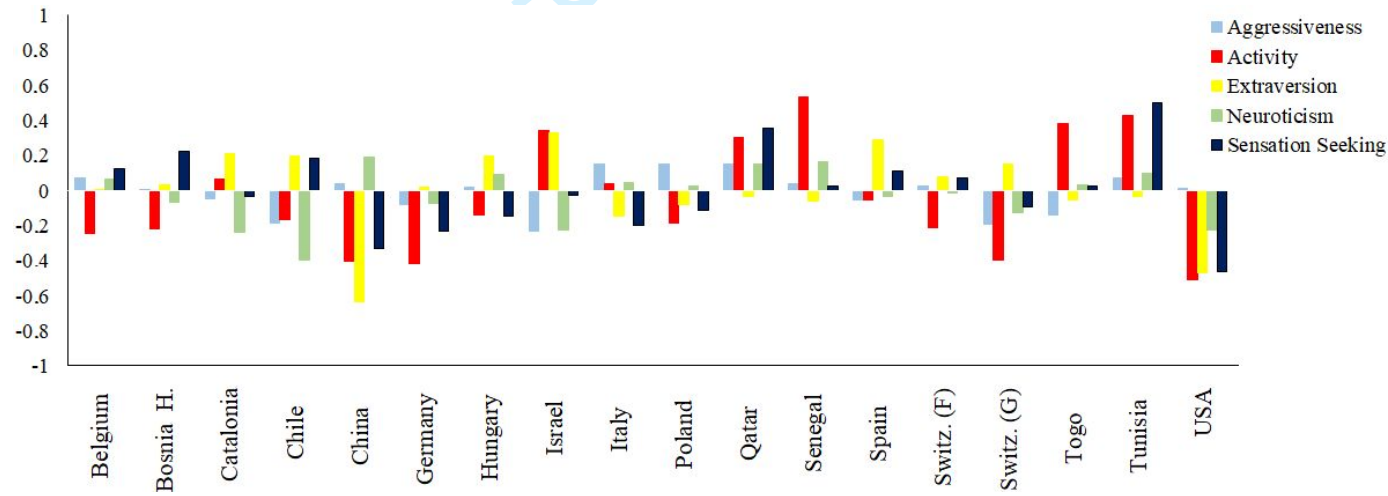


Figure 2. Standardized z-scores of personality factors by culture controlling for age and sex.



Figure 3. Bi-dimension plot of mean personality profiles of cultures. The first dimension is strongly associated with Activity and Sensation Seeking and the second dimension is positively associated with Neuroticism and Aggressiveness and negatively with Extraversion.

TABLES

Table 1. Characteristics of the Sub-samples (n =10,298).

Culture	Language	Women	%	Men	%	Age		
						Mean	SD	n
Belgium	French	168	49.9	169	50.1	45.16	17.09	337
Bosnia H.	Bosnian	217	48.7	229	51.3	45.73	16.88	446
Catalonia	Catalan	335	49.8	338	50.2	41.66	17.78	673
Chile	Spanish	200	50.0	200	50.0	43.31	17.41	400
China	Mandarin	313	51.4	296	48.6	24.75	7.85	609
Germany	German	356	50.9	344	49.1	45.22	18.70	700
Hungary	Hungarian	380	65.5	200	34.5	40.20	16.91	580
Israel	Hebrew	143	51.3	136	48.7	43.43	17.46	279
Italy	Italian	209	50.5	205	49.5	40.54	14.85	414
Poland	Polish	332	65.1	178	34.9	37.80	13.31	510
Qatar	Arabic	398	49.8	401	50.2	44.40	16.91	799
Senegal	French	762	48.9	797	51.1	--	--	1,559
Spain	Spanish	468	53.4	409	46.6	40.44	20.71	877
Switzerland (F)	French	139	43.2	183	56.8	38.86	15.99	322
Switzerland (G)	German	372	61.1	237	38.9	36.41	17.15	609
Togo	French	200	56.5	154	43.5	30.03	9.74	354
Tunisia	Arabic	196	50.0	196	50.0	44.13	16.63	392
US	English	222	50.7	216	49.3	44.65	15.08	438

Note: Only age ranges were available for the sample from Senegal. SD: Standard deviation

Table 2. Principal axis factors of the ZKA-PQ and the ZKA-PQ/SF (total sample) after orthogonal Procrustes rotation to the structures of the original Spanish studies.

ZKA-PQ facet	<i>ZKA-PQ original with current ZKA-PQ/SF</i>						<i>ZKP-PQ/SF original with current ZKA-PQ/SF</i>					
	AG	AC	EX	NE	SS	CCs	AG	AC	EX	NE	SS	CCs
AG1: Physical aggres	.58	.09	-.18	.02	.20	.97	.59	.08	-.17	.04	.19	.97
AG2: Verbal aggression	.57	-.20	.03	.07	.14	.92	.57	-.21	.05	.08	.12	.97
AG3: Anger	.74	.08	-.12	.26	.07	.99	.74	.07	-.10	.28	.05	<i>1</i>
AG4: Hostility	.67	.00	-.14	.29	.13	.99	.67	.00	-.11	.30	.11	<i>1</i>
AC1: Work compulsion	-.04	.64	-.06	.02	.09	.97	-.03	.63	-.18	.02	.09	<i>1</i>
AC2: General activity	-.05	.63	.17	-.07	.11	.97	-.05	.63	.15	-.08	.11	.99
AC3: Restlessness	.29	.43	.09	.13	.28	.98	.30	.42	.08	.13	.28	.98
AC4: Work energy	-.11	.65	.22	-.12	-.09	.97	-.11	.66	.20	-.13	-.08	.98
EX1: Positive emotions	-.12	.24	.58	-.30	.14	.98	-.13	.26	.56	-.31	.16	<i>1</i>
EX2: Social warmth	-.15	-.12	.52	-.15	-.08	.94	-.16	-.10	.52	-.17	-.07	.99
EX3: Exhibitionism	.11	.15	.50	-.02	.29	.96	.11	.16	.50	-.02	.29	.97
EX4: Sociability	-.05	.14	.70	-.12	.15	.98	-.06	.16	.69	-.13	.16	<i>1</i>
NE1: Anxiety	.32	.17	-.20	.62	.11	<i>1</i>	.32	.17	-.19	.63	.10	.99
NE2: Depression	.19	.02	-.22	.71	.05	.99	.19	.02	-.20	.72	.03	.99
NE3: Dependency	.16	.10	.03	.70	-.01	.95	.15	.11	.04	.70	-.02	.99
NE4: Low self-esteem	.09	-.11	-.26	.68	.00	.99	.09	-.12	-.24	.69	-.01	<i>1</i>
SS1: Thrill and adventure s.	.10	.19	-.07	-.15	.54	.97	.12	.18	-.08	-.14	.54	.99
SS2: Experience seeking	-.01	.12	.12	.00	.61	.96	.01	.12	.11	.00	.61	.99
SS3: Disinhibition	.21	.04	.22	.10	.67	.99	.22	.04	.22	.10	.66	<i>1</i>
SS4: Boredom susceptibility	.12	.01	.02	.06	.53	.98	.14	.00	.02	.07	.53	.99
<i>Congruence coefficient (CCs)</i>	<i>.98</i>	<i>.95</i>	<i>.97</i>	<i>.99</i>	<i>.97</i>	<i>.97</i>	<i>.99</i>	<i>.97</i>	<i>.99</i>	<i>.99</i>	<i>.99</i>	<i>.99</i>

Note. Principal axis and Varimax rotation: ZKA-PQ (Aluja, et al., 2010) and ZKA-PQ/SF (Aluja et al., 2018) Spanish-speaking original factor matrices. Loadings greater than .40 in absolute magnitude are given in boldface type. ZKA-PQ/SF = Zuckerman-Kuhlman-Aluja Personality Questionnaire shortened form; AG = Aggressiveness; AC = Activity; EX = Extraversion; NE = Neuroticism; SS = Sensation Seeking.

Table 3. Congruence coefficients for every culture and personality factor.

Sub-sample	ZKA-PQ original vs ZKA-PQ/SF current study						ZK-PQ/SF original vs ZKA-PQ/SF current study					
	AG	AC	EX	NE	SS	Total	AG	AC	EX	NE	SS	Total
Belgium	.95	.94	.97	.97	.94	.95	.97	.96	.99	.97	.96	.97
Bosnia H.	.96	.92	.95	.97	.96	.95	.99	.99	.98	.99	.99	.99
Catalonia	.99	.98	.98	.99	.98	.98	.97	.96	.95	.98	.98	.96
Chile	.97	.94	.93	.97	.95	.95	.97	.96	.95	.98	.98	.96
China	.95	.93	.92	.97	.93	.94	.97	.92	.96	.97	.95	.95
Germany	.97	.96	.95	.97	.97	.96	.98	.97	.98	.98	.97	.97
Hungary	.97	.96	.96	.98	.97	.97	.98	.97	.99	.98	.98	.98
Israel	.96	.95	.94	.96	.95	.95	.98	.95	.97	.97	.97	.97
Italy	.98	.95	.95	.97	.96	.96	.98	.98	.97	.98	.98	.98
Poland	.98	.94	.95	.97	.97	.96	.98	.93	.97	.97	.97	.97
Qatar	.95	.88	.91	.96	.94	.93	.97	.90	.93	.96	.95	.94
Senegal	.95	.93	.89	.89	.84	.90	.96	.94	.88	.90	.85	.90
Spain	.98	.97	.97	.99	.98	.98	.99	.99	1	1	1	.99
Switzerland (F)	.95	.91	.93	.98	.98	.95	.97	.93	.97	.98	.98	.97
Switzerland (G)	.97	.97	.96	.98	.98	.97	.99	.96	.98	.98	.98	.98
Togo	.94	.92	.91	.91	.83	.90	.95	.95	.91	.91	.86	.91
Tunisia	.96	.86	.93	.94	.95	.93	.98	.90	.96	.94	.96	.95
USA	.96	.96	.95	.98	.95	.96	.96	.98	.96	.97	.97	.97
Total	.96	.94	.94	.96	.95	.95	.99	.97	.99	.99	.99	.99

Note. AG = Aggressiveness; AC = Activity; EX = Extraversion; NE = Neuroticism; SS = Sensation Seeking. Factor and total congruence coefficients comparing five Procrustes-rotated principal axis in each sub-sample with the original matrices of the ZKA-PQ (Aluja et al., 2010) and ZKA-PQ/SF (Aluja et al., 2018). Congruence Coefficients below .90 are in bold type.

Table 4. Internal consistencies for each culture and each personality factor.

Sub-sample	<i>n</i> =10,298	ZKA-PQ/SF				
		AG	AC	EX	NE	SS
Belgium	337	.85	.83	.81	.87	.81
Bosnia H.	446	.82	.82	.84	.88	.81
Catalonia	673	.89	.84	.85	.89	.85
Chile	400	.86	.78	.82	.90	.77
China	609	.83	.82	.85	.85	.78
Germany	700	.85	.81	.85	.88	.77
Hungary	580	.87	.82	.84	.90	.81
Israel	279	.88	.83	.82	.88	.79
Italy	414	.84	.82	.83	.87	.79
Poland	510	.86	.79	.85	.89	.82
Qatar	799	.86	.70	.77	.79	.73
Senegal	1,559	.75	.66	.56	.71	.56
Spain	877	.89	.82	.86	.89	.88
Switzerland (F)	322	.88	.79	.80	.89	.81
Switzerland (G)	609	.82	.87	.86	.90	.77
Togo	354	.81	.72	.74	.83	.57
Tunisia	392	.85	.72	.76	.78	.72
US	438	.91	.85	.90	.94	.85
<i>Alpha average</i>		.85	.79	.81	.86	.77

Note. AG = Aggressiveness; AC = Activity; EX = Extraversion; NE = Neuroticism; SS = Sensation Seeking.

APPENDICES

A-1.

Means, standard deviations and internal consistency reliabilities for women and men for each culture and for each ZKA-PQ/SF factor.

		AG			AC			EX			NE			SS		
		α	Mean	SD	α	Mean	SD	α	Mean	SD	α	Mean	SD	α	Mean	SD
Belgium	W	.86	35.35	7.36	.85	40.06	7.03	.82	46.84	5.97	.88	33.78	7.64	.79	41.06	6.62
	M	.79	32.78	5.95	.80	41.41	6.18	.81	47.55	5.97	.84	37.64	6.75	.80	36.59	6.80
B-H.	W	.80	32.50	7.18	.83	41.35	7.74	.82	47.81	7.18	.88	34.52	8.78	.83	39.66	7.91
	M	.81	34.47	7.54	.82	40.52	7.68	.86	47.03	7.70	.88	34.69	8.58	.79	39.54	7.42
Catalonia	W	.90	32.38	9.46	.83	43.21	7.78	.85	49.50	7.81	.89	35.20	9.62	.86	36.65	9.09
	M	.88	34.37	9.03	.85	42.64	8.29	.85	48.12	7.69	.87	31.57	8.51	.84	39.55	8.95
Chile	W	.88	32.72	8.86	.80	40.95	7.40	.83	48.43	7.64	.91	32.50	10.40	.78	39.16	7.46
	M	.83	31.18	7.47	.76	41.63	6.87	.80	48.73	7.01	.88	31.19	8.89	.77	39.32	7.38
China	W	.82	34.61	7.11	.81	39.41	6.62	.85	43.23	7.43	.85	39.02	7.20	.80	37.37	7.06
	M	.84	35.59	8.05	.83	39.02	7.22	.84	43.30	7.62	.84	36.56	7.59	.76	38.04	6.91
Germany	W	.84	32.10	6.72	.77	39.63	6.10	.86	48.50	7.02	.89	36.53	8.06	.78	34.64	6.51
	M	.85	33.67	7.08	.84	39.26	7.27	.84	46.11	6.63	.85	32.64	6.87	.74	37.71	6.42
Hungary	W	.87	34.00	8.19	.79	42.42	6.72	.84	48.99	7.10	.90	38.21	8.96	.83	36.66	7.55
	M	.88	33.71	8.50	.85	39.68	7.69	.86	48.59	7.26	.89	33.41	8.62	.78	38.08	7.14

ZKA-PQ across cultures 2

1																	
2	Israel	W	.86	31.14	7.80	.81	45.40	7.25	.82	50.43	6.83	.87	35.06	8.52	.78	35.97	7.33
3																	
4		M	.90	32.42	9.34	.85	44.55	8.03	.83	48.81	6.90	.88	31.80	8.55	.78	40.07	7.40
5	Italy	W	.83	33.24	7.96	.82	43.44	7.96	.83	46.08	7.93	.86	38.22	9.00	.80	35.05	7.82
6																	
7		M	.84	36.91	8.36	.81	41.96	7.90	.84	46.49	7.87	.86	33.39	8.75	.76	38.96	7.71
8																	
9	Poland	W	.86	35.25	7.96	.80	41.16	6.83	.85	46.88	7.11	.88	37.88	8.38	.83	36.79	7.89
10																	
11		M	.85	34.84	8.12	.76	40.93	6.77	.86	46.92	7.85	.88	32.92	8.36	.80	39.58	7.60
12	Qatar	W	.84	34.27	8.45	.72	44.45	6.70	.76	46.98	6.54	.78	37.23	7.22	.74	39.77	7.31
13																	
14		M	.87	35.18	9.08	.68	45.08	6.25	.78	46.93	6.76	.79	35.72	7.20	.73	41.50	6.93
15																	
16	Senegal	W	.75	34.30	7.33	.69	46.22	6.07	.58	46.86	5.32	.70	37.63	6.51	.57	37.55	5.75
17																	
18		M	.76	33.46	7.17	.62	46.60	5.45	.60	46.69	5.39	.72	35.68	6.59	.54	38.93	5.51
19	Spain	W	.90	33.08	9.41	.83	42.38	7.69	.85	49.83	7.82	.88	37.15	9.28	.89	38.50	10.25
20																	
21		M	.88	33.59	9.05	.81	41.73	7.30	.86	48.94	7.98	.90	32.96	9.30	.87	39.93	9.72
22																	
23	Swit. (F)	W	.85	34.16	7.41	.78	40.69	6.32	.82	47.53	6.42	.89	32.37	8.02	.81	41.79	7.46
24																	
25		M	.90	34.23	8.52	.80	40.89	6.15	.78	48.24	5.72	.88	37.51	7.60	.79	37.53	6.76
26																	
27	Swit. (G)	W	.81	32.34	6.05	.79	39.79	6.25	.86	49.03	6.87	.89	36.45	8.08	.77	37.23	6.61
28																	
29		M	.83	32.54	6.81	.84	38.95	7.24	.85	47.91	6.87	.89	32.26	8.06	.77	39.44	6.83
30	Togo	W	.78	32.75	7.05	.69	45.74	5.46	.74	47.61	5.94	.82	35.15	7.53	.57	40.64	5.09
31																	
32		M	.83	34.12	8.03	.74	44.28	5.77	.74	46.95	6.13	.83	37.96	7.83	.55	38.76	5.11
33	Tunisia	W	.83	33.96	8.09	.71	45.01	6.48	.78	46.67	6.89	.77	37.37	6.90	.75	40.76	7.23
34																	
35		M	.87	34.27	9.20	.72	46.31	6.59	.74	47.26	6.55	.78	34.73	6.99	.69	42.73	6.76
36																	
37	USA	W	.90	32.39	9.18	.84	39.26	7.79	.90	44.77	9.10	.94	33.52	10.89	.86	32.94	8.27
38																	
39		M	.91	34.86	9.88	.86	38.25	8.16	.90	42.86	9.12	.95	33.18	11.29	.83	36.00	7.78

Note. B-H. = Bosnia-Herzegovina; USA = United States; W = Women; M = Men; AG = Aggressiveness; AC = Activity;

EX = Extraversion; NE = Neuroticism; SS = Sensation Seeking. W = Women; M = Men.

A-2.

Means, standard deviations, and internal consistency for women and men for each culture and for each AG facet.

	W =Women; M =Men.	n	AG1			AG2			AG3			AG4		
			α	M	SD	α	M	SD	α	M	SD	α	M	SD
Belgium	W	168	.84	7.64	2.82	.59	10.16	2.19	.65	9.80	2.20	.60	7.76	2.08
	M	169	.74	6.32	2.21	.49	9.54	2.10	.35	9.37	1.69	.50	7.55	1.81
Bosnia H.	W	217	.59	6.82	2.31	.65	9.79	2.70	.67	8.44	2.51	.55	7.45	2.20
	M	229	.60	7.61	2.54	.60	10.36	2.57	.70	8.62	2.59	.55	7.87	2.30
Catalonia	W	335	.82	5.96	2.70	.74	9.98	3.08	.79	8.86	3.00	.71	7.58	2.70
	M	338	.84	7.49	3.10	.70	10.53	2.86	.72	8.72	2.75	.60	7.63	2.45
Chile	W	200	.74	6.73	2.50	.68	9.85	2.77	.77	8.29	2.95	.65	7.86	2.63
	M	200	.72	6.88	2.45	.56	9.33	2.39	.63	7.65	2.43	.59	7.32	2.34
China	W	313	.83	7.05	2.74	.48	9.23	2.25	.47	10.50	2.10	.67	7.84	2.35
	M	296	.82	8.52	3.20	.50	9.78	2.36	.53	9.80	2.33	.62	7.48	2.38
Germany	W	356	.66	5.56	1.80	.59	10.35	2.44	.67	8.45	2.24	.57	7.73	2.03
	M	344	.79	6.55	2.32	.49	10.74	2.44	.65	8.35	2.15	.55	8.03	2.05
Hungary	W	380	.68	6.87	2.20	.65	10.06	2.75	.74	8.94	2.71	.66	8.13	2.42
	M	200	.77	7.50	2.61	.60	10.35	2.69	.79	8.06	2.83	.65	7.80	2.35
Israel	W	143	.58	5.95	1.95	.74	8.85	2.78	.72	8.48	2.73	.58	7.86	2.23
	M	136	.82	6.89	2.81	.70	9.24	2.87	.77	8.31	2.87	.59	7.99	2.43
Italy	W	209	.76	6.20	2.48	.68	10.01	2.75	.67	9.08	2.71	.52	7.95	2.36
	M	205	.80	7.91	3.09	.56	11.17	2.72	.68	9.54	2.78	.54	8.30	2.45
Poland	W	332	.83	6.70	2.71	.66	10.71	2.62	.69	8.95	2.47	.63	8.88	2.36
	M	178	.79	7.70	2.94	.57	10.32	2.50	.58	8.36	2.33	.49	8.46	2.28
Qatar	W	398	.70	7.08	2.78	.58	8.57	2.66	.64	9.87	2.68	.54	8.77	2.45
	M	401	.73	7.85	2.98	.63	8.86	2.76	.62	9.73	2.63	.59	8.74	2.59
Senegal	W	762	.65	8.37	2.80	.34	8.64	2.40	.40	9.74	2.37	.50	7.55	2.47
	M	797	.70	8.32	2.94	.26	8.35	2.21	.36	9.51	2.20	.48	7.29	2.33

Spain	W	468	.81	5.99	2.59	.77	10.33	3.24	.80	9.10	3.03	.69	7.65	2.69
	M	409	.89	7.14	3.22	.74	10.29	2.98	.75	8.52	2.81	.62	7.64	2.48
Swit. F.	W	139	.83	7.27	2.81	.69	9.89	2.63	.45	9.58	1.94	.61	7.42	2.06
	M	183	.84	6.65	2.79	.67	9.71	2.54	.71	10.02	2.47	.69	7.85	2.25
Swit. G.	W	372	.68	5.40	1.57	.62	10.42	2.36	.61	8.74	2.05	.58	7.77	1.96
	M	237	.79	6.01	2.19	.62	10.68	2.44	.61	8.15	2.17	.49	7.70	1.95
Togo	W	200	.69	7.33	2.55	.50	8.13	2.32	.40	9.19	2.23	.50	8.11	2.32
	M	154	.75	7.51	2.88	.46	8.64	2.39	.67	9.58	2.66	.47	8.39	2.31
Tunisia	W	196	.61	7.32	2.55	.58	8.17	2.59	.58	10.14	2.51	.56	8.34	2.44
	M	196	.73	7.66	2.93	.63	8.75	2.91	.66	9.51	2.74	.51	8.35	2.45
USA	W	222	.86	6.59	2.85	.34	10.45	2.81	.80	8.20	2.81	.73	7.15	2.71
	M	216	.87	7.89	3.20	.26	10.73	2.74	.85	8.38	3.02	.74	7.87	2.78

A-3.

Means, standard deviations and internal consistency for women and men for each culture and for each AC facet.

W = Women; M = Men.	<i>n</i>	AC1			AC2			AC3			AC4			
		α	Mean	SD	α	Mean	SD	α	Mean	SD	α	Mean	SD	
Belgium	W	168	.72	7.87	2.61	.81	10.69	2.57	.71	8.74	2.31	.76	12.76	2.18
	M	169	.62	7.80	2.33	.78	11.09	2.51	.63	9.44	2.04	.70	13.08	1.93
Bosnia H.	W	217	.67	9.18	2.75	.77	10.57	3.00	.49	9.53	2.29	.76	12.06	2.49
	M	229	.64	8.84	2.66	.74	10.02	2.93	.53	9.49	2.36	.71	12.16	2.38
Catalonia	W	335	.71	8.24	2.97	.78	11.76	2.70	.65	9.96	2.71	.76	13.24	2.37
	M	338	.76	8.18	3.12	.83	11.44	2.97	.67	9.84	2.66	.82	13.18	2.64
Chile	W	200	.63	8.00	2.64	.69	10.88	2.59	.61	9.60	2.62	.69	12.48	2.58
	M	200	.58	8.57	2.52	.68	10.80	2.61	.62	9.52	2.59	.65	12.75	2.36
China	W	313	.65	9.04	2.39	.60	9.70	2.28	.66	8.75	2.39	.74	11.93	2.14
	M	296	.60	9.33	2.43	.61	9.32	2.37	.60	8.45	2.28	.76	11.92	2.34
Germany	W	356	.56	8.67	2.18	.68	10.51	2.39	.61	8.62	2.20	.60	11.83	1.99
	M	344	.73	8.67	2.75	.64	10.31	2.28	.64	8.51	2.28	.70	11.76	2.20
Hungary	W	380	.63	8.93	2.63	.71	11.43	2.48	.50	9.01	2.22	.72	13.05	2.23
	M	200	.66	8.48	2.72	.80	10.67	2.77	.53	8.29	2.18	.77	12.25	2.39
Israel	W	143	.66	10.34	2.79	.79	12.40	2.62	.61	9.29	2.63	.58	13.37	1.98
	M	136	.68	10.35	2.85	.77	11.64	2.59	.66	9.34	2.69	.74	13.23	2.38
Italy	W	209	.51	8.81	2.66	.79	11.95	2.90	.67	9.72	2.84	.65	7.95	2.36
	M	205	.39	8.67	2.52	.74	11.30	2.93	.53	9.31	2.59	.69	12.68	2.45
Poland	W	332	.57	8.93	2.50	.70	10.83	2.54	.50	9.47	2.09	.70	12.15	2.21
	M	178	.66	8.91	2.79	.66	10.48	2.56	.36	9.24	2.05	.63	12.07	2.29
Qatar	W	398	.57	10.39	2.76	.43	10.94	2.28	.55	10.20	2.56	.68	12.92	2.46
	M	401	.48	10.69	2.55	.47	11.19	2.27	.48	10.37	2.38	.70	12.83	2.48

ZKA-PQ/SF Across Cultures 6

1															
2															
3	Senegal	W	762	.43	11.23	2.31	.55	11.61	2.35	.49	9.62	2.42	.50	13.76	1.96
4															
5		M	797	.34	11.27	2.27	.55	11.97	2.28	.38	9.49	2.20	.51	13.87	1.88
6	Spain	W	468	.73	7.77	2.83	.79	11.73	2.80	.63	10.07	2.68	.80	12.81	2.58
7															
8		M	409	.73	7.86	2.94	.78	11.27	2.71	.62	9.59	2.57	.80	13.01	2.45
9	Swit. F.	W	139	.73	8.03	2.54	.68	11.12	2.25	.59	8.91	2.35	.81	12.63	2.33
10															
11		M	183	.61	7.69	2.22	.79	10.95	2.55	.65	9.19	2.32	.76	13.07	1.89
12	Swit. G.	W	372	.63	8.75	2.26	.69	10.53	2.34	.59	8.50	2.17	.68	12.01	2.01
13															
14		M	237	.70	8.68	2.60	.72	10.24	2.44	.64	8.32	2.27	.73	11.73	2.34
15	Togo	W	200	.30	10.11	2.11	.65	12.18	2.16	.35	9.59	2.00	.54	13.87	1.65
16															
17		M	154	.44	9.98	2.11	.67	11.39	2.27	.35	9.55	2.02	.64	13.36	1.77
18	Tunisia	W	196	.48	10.96	2.59	.65	11.38	2.59	.50	9.20	2.47	.71	13.47	2.23
19															
20		M	196	.55	11.13	2.74	.54	12.01	2.37	.45	9.81	2.43	.78	13.36	2.43
21	USA	W	222	.75	8.23	2.97	.86	10.61	2.99	.75	8.25	2.56	.78	12.17	2.58
22															
23		M	216	.79	8.30	3.06	.84	10.22	2.80	.69	8.32	2.39	.78	11.40	2.75
24															
25															
26															
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A-4.

Means, standard deviations and internal consistency for Women and Men for each Culture and for each EX facet.

W=Women; M=Men.	<i>n</i>	EX1			EX2			EX3			EX4			
		α	Mean	SD	α	Mean	SD	α	Mean	SD	α	Mean	SD	
Belgium	W	168	.58	12.23	1.65	.67	10.88	2.32	.77	11.68	2.12	.64	12.05	2.08
	M	169	.47	12.49	1.60	.78	11.75	2.63	.75	10.90	2.16	.40	12.41	1.70
Bosnia H.	W	217	.71	12.29	2.21	.78	11.54	2.99	.80	11.60	2.65	.67	12.38	2.42
	M	229	.75	11.91	2.36	.75	11.42	2.81	.83	11.59	2.74	.66	12.11	2.33
Catalonia	W	335	.78	13.39	2.27	.78	12.29	3.06	.82	11.14	2.99	.66	12.67	2.39
	M	338	.75	13.25	2.14	.79	10.89	3.08	.82	11.65	2.76	.61	12.33	2.33
Chile	W	200	.63	13.23	2.06	.81	11.74	3.16	.68	11.18	2.61	.64	12.29	2.50
	M	200	.58	13.21	2.05	.70	11.49	2.79	.73	11.39	2.74	.56	12.64	2.14
China	W	313	.78	11.46	2.32	.77	10.03	2.84	.81	10.84	2.72	.53	10.90	2.16
	M	296	.71	11.34	2.44	.76	9.98	2.93	.79	11.19	2.59	.57	10.79	2.27
Germany	W	356	.66	12.25	1.96	.77	12.74	2.47	.75	10.78	2.43	.69	12.73	2.21
	M	344	.67	11.83	1.93	.77	11.43	2.48	.75	11.00	2.35	.67	11.85	2.22
Hungary	W	380	.75	12.83	2.22	.83	12.46	2.99	.71	11.73	2.38	.64	11.98	2.28
	M	200	.74	12.53	2.23	.81	11.70	2.81	.74	12.64	2.15	.74	11.73	2.59
Israel	W	143	.77	13.68	2.29	.70	13.29	2.42	.69	11.29	2.53	.57	12.17	2.19
	M	136	.77	13.29	2.17	.71	11.92	2.68	.72	11.99	2.49	.42	11.61	1.93

Italy	W	209	.70	11.93	2.43	.76	11.50	3.09	.78	10.62	2.99	.64	12.02	2.51
	M	205	.66	12.30	2.25	.77	10.87	3.14	.75	11.44	2.77	.61	11.88	2.46
Poland	W	332	.70	12.27	2.08	.77	12.29	2.70	.77	10.74	2.45	.70	11.59	2.32
	M	178	.69	12.03	2.18	.74	11.78	2.87	.78	11.60	2.63	.74	11.52	2.53
Qatar	W	398	.63	12.23	2.20	.50	11.01	2.41	.48	11.96	2.10	.54	11.78	2.37
	M	401	.57	12.32	2.14	.60	10.81	2.57	.52	11.95	2.09	.54	11.85	2.43
Senegal	W	762	.43	12.11	1.95	.42	11.01	2.44	.55	11.62	2.32	.19	12.12	1.90
	M	797	.40	11.93	1.95	.45	10.84	2.40	.56	11.54	2.37	.29	12.38	1.96
Spain	W	468	.77	13.28	2.26	.79	12.42	3.13	.84	11.44	2.97	.63	12.69	2.30
	M	409	.77	13.16	2.25	.82	11.58	3.21	.82	12.00	2.73	.65	12.20	2.45
Swit. F.	W	139	.72	12.65	1.92	.82	10.89	2.91	.81	12.14	2.22	.71	11.83	2.33
	M	183	.64	12.77	1.66	.72	12.16	2.45	.79	11.10	2.32	.61	12.21	2.10
Swit. G.	W	372	.73	12.44	1.91	.82	12.91	2.64	.80	11.10	2.46	.71	12.58	2.29
	M	237	.73	12.14	2.03	.81	11.85	2.71	.75	11.80	2.23	.72	12.11	2.30
Togo	W	200	.44	12.47	1.76	.58	10.76	2.53	.72	12.26	2.31	.48	12.13	2.08
	M	154	.52	12.35	1.89	.64	10.90	2.74	.68	12.06	2.25	.38	11.64	2.02
Tunisia	W	196	.64	12.34	2.08	.51	11.17	2.53	.57	11.67	2.28	.57	11.49	2.51
	M	196	.64	12.66	2.13	.62	10.49	2.83	.55	11.87	2.28	.58	12.24	2.40
USA	W	222	.81	11.73	2.63	.84	12.30	3.01	.73	10.74	2.56	.81	9.99	3.07
	M	216	.84	11.02	2.90	.83	11.35	3.00	.73	10.71	2.42	.81	9.78	3.00

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A-5.

Mean, standard deviations and internal reliabilities for Women and Men for each culture and for each NE facet.

W=Women;M=Men.	<i>n</i>	NE1			NE2			NE3			NE4			
		α	Mean	SD	α	Mean	SD	α	Mean	SD	α	Mean	SD	
Belgium	W	168	.61	12.23	1.65	.69	10.88	2.32	.66	11.68	2.12	.76	8.11	2.42
	M	169	.55	8.76	2.00	.60	8.97	2.19	.65	10.69	2.14	.75	9.22	2.41
Bosnia H.	W	217	.76	12.29	2.21	.69	11.54	2.99	.63	11.60	2.65	.81	12.38	2.42
	M	229	.75	11.91	2.36	.76	11.42	2.81	.59	11.59	2.74	.74	12.11	2.33
Catalonia	W	335	.67	13.39	2.27	.74	12.29	3.06	.67	11.14	2.99	.82	12.67	2.39
	M	338	.69	13.25	2.14	.69	10.89	3.08	.68	11.65	2.76	.75	12.33	2.33
Chile	W	200	.78	13.23	2.06	.77	11.74	3.16	.68	11.18	2.61	.79	12.29	2.50
	M	200	.67	13.21	2.05	.70	11.49	2.79	.70	11.39	2.74	.65	12.64	2.14
China	W	313	.67	11.46	2.32	.64	10.03	2.84	.58	10.84	2.72	.61	10.90	2.16
	M	296	.67	11.34	2.44	.65	9.98	2.93	.59	11.19	2.59	.60	10.79	2.27
Germany	W	356	.69	12.25	1.96	.77	12.74	2.47	.65	10.78	2.43	.78	12.73	2.21
	M	344	.62	11.83	1.93	.68	11.43	2.48	.54	11.00	2.35	.72	11.85	2.22

1															
2															
3	Hungary	W	380	.71	12.83	2.22	.75	12.46	2.99	.69	11.73	2.38	.80	11.98	2.28
4															
5		M	200	.73	12.53	2.23	.73	11.70	2.81	.64	12.64	2.15	.78	11.73	2.59
6															
7	Israel	W	143	.68	13.68	2.29	.71	13.29	2.42	.63	11.29	2.53	.66	12.17	2.19
8															
9		M	136	.69	13.29	2.17	.66	11.92	2.68	.74	11.99	2.49	.73	11.61	1.93
10															
11	Italy	W	209	.62	11.93	2.43	.69	11.50	3.09	.70	10.62	2.99	.75	12.02	2.51
12															
13		M	205	.73	12.30	2.25	.63	10.87	3.14	.65	11.44	2.77	.73	11.88	2.46
14															
15	Poland	W	332	.71	12.27	2.08	.67	12.29	2.70	.65	10.74	2.45	.75	11.59	2.32
16															
17		M	178	.66	12.03	2.18	.72	11.78	2.87	.62	11.60	2.63	.81	11.52	2.53
18															
19	Qatar	W	398	.48	12.23	2.20	.56	11.01	2.41	.51	11.96	2.10	.55	11.78	2.37
20															
21		M	401	.55	12.32	2.14	.57	10.81	2.57	.39	11.95	2.09	.56	11.85	2.43
22															
23	Senegal	W	762	.38	12.11	1.95	.45	11.01	2.44	.43	11.62	2.32	.47	12.12	1.90
24															
25		M	797	.44	11.93	1.95	.51	10.84	2.40	.42	11.54	2.37	.46	12.38	1.96
26															
27	Spain	W	468	.66	13.28	2.26	.73	12.42	3.13	.67	11.44	2.97	.82	12.69	2.30
28															
29		M	409	.71	13.16	2.25	.75	11.58	3.21	.68	12.00	2.73	.83	12.20	2.45
30															
31	Swit. F.	W	139	.59	12.65	1.92	.68	10.89	2.91	.74	12.14	2.22	.80	11.83	2.33
32															
33		M	183	.65	12.77	1.66	.76	12.16	2.45	.62	11.10	2.32	.80	12.21	2.10
34															
35	Swit. G.	W	372	.63	12.44	1.91	.75	12.91	2.64	.69	11.10	2.46	.83	12.58	2.29
36															
37		M	237	.66	12.14	2.03	.70	11.85	2.71	.61	11.80	2.23	.77	12.11	2.30
38															
39	Togo	W	200	.56	12.47	1.76	.63	10.76	2.53	.64	10.25	2.78	.59	12.13	2.08
40															
41		M	154	.45	12.35	1.89	.69	10.90	2.74	.67	12.06	2.25	.59	11.64	2.02
42															
43	Tunisia	W	196	.48	12.34	2.08	.59	11.17	2.53	.43	11.67	2.28	.70	11.49	2.51
44															
45		M	196	.62	12.66	2.13	.54	10.49	2.83	.40	11.87	2.28	.62	12.24	2.40
46															
47	USA	W	222	.85	11.73	2.63	.81	12.30	3.01	.77	10.74	2.56	.90	9.99	3.07
48															
49		M	216	.84	11.02	2.90	.85	11.35	3.00	.78	10.71	2.42	.86	9.78	3.00
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A-6.

Means, standard deviations and internal consistency for Women and Men for each culture and for each SS facet.

		SS1			SS2			SS3			SS4			
W=Women; M = Men.	<i>n</i>	α	Mean	SD	α	Mean	SD	α	Mean	SD	α	Mean	SD	
Belgium	W	168	.69	9.79	2.78	.72	10.82	2.55	.60	10.62	2.12	.45	9.84	1.90
	M	169	.63	7.33	2.43	.74	9.96	2.78	.58	9.62	2.21	.45	9.67	1.90
Bosnia H.	W	217	.75	8.14	3.17	.67	12.17	2.52	.56	9.53	2.34	.51	9.83	2.31
	M	229	.64	8.63	2.95	.58	11.68	2.45	.60	9.70	2.46	.44	9.53	2.19
Catalonia	W	335	.77	7.26	3.16	.72	10.78	3.04	.69	9.46	2.89	.57	9.14	2.50
	M	338	.71	9.60	3.27	.66	10.45	2.89	.73	10.07	2.94	.54	9.42	2.47
Chile	W	200	.63	8.77	2.86	.59	11.87	2.46	.62	9.03	2.66	.51	9.50	2.43
	M	200	.59	9.42	2.80	.52	11.22	2.46	.60	8.90	2.51	.49	9.78	2.43

1															
2															
3	China	W	313	.64	7.72	2.57	.57	10.27	2.42	.65	9.08	2.44	.35	10.31	1.91
4															
5		M	296	.58	8.47	2.57	.54	9.74	2.50	.58	9.51	2.46	.32	10.32	2.02
6	Germany	W	356	.61	6.47	2.25	.74	9.63	2.76	.48	9.38	2.05	.45	9.16	2.04
7															
8		M	344	.60	8.71	2.62	.68	10.18	2.64	.44	9.35	2.00	.38	9.48	1.97
9	Hungary	W	380	.67	7.02	2.61	.65	11.18	2.55	.67	9.21	2.45	.58	9.24	2.33
10															
11		M	200	.60	8.95	2.78	.67	10.93	2.56	.68	9.04	2.67	.41	9.17	2.01
12	Israel	W	143	.71	8.25	2.94	.65	10.41	2.75	.63	8.39	2.45	.54	8.92	2.36
13															
14		M	136	.66	10.80	2.95	.63	10.98	2.73	.57	8.79	2.34	.55	9.49	2.37
15	Italy	W	209	.63	6.83	2.65	.66	10.50	2.86	.58	8.71	2.50	.49	9.01	2.53
16															
17		M	205	.62	8.84	3.11	.67	10.90	2.95	.60	9.65	2.63	.39	9.56	2.37
18	Poland	W	332	.75	8.15	2.99	.67	10.86	2.67	.69	8.53	2.56	.43	9.24	2.11
19															
20		M	178	.63	9.74	2.94	.66	11.12	2.67	.56	9.19	2.38	.54	9.53	2.31
21	Qatar	W	398	.66	8.12	3.09	.60	11.16	2.81	.48	10.56	2.44	.21	9.93	2.03
22															
23		M	401	.67	9.42	3.09	.62	11.39	2.74	.38	10.61	2.16	.25	10.08	2.01
24	Senegal	W	762	.41	8.59	2.52	.52	10.98	2.61	.42	8.96	2.26	.20	9.02	2.01
25															
26		M	797	.37	9.54	2.50	.45	11.30	2.41	.40	9.04	2.15	.19	9.05	1.99
27	Spain	W	468	.77	7.74	3.28	.72	11.44	3.03	.77	9.68	3.22	.70	9.65	2.89
28															
29		M	409	.76	9.66	3.41	.74	11.13	3.13	.76	9.47	3.08	.61	9.66	2.64
30	Swit. F.	W	139	.63	9.61	2.84	.74	11.42	2.79	.63	10.61	2.36	.47	10.14	2.07
31															
32		M	183	.68	6.97	2.47	.71	10.86	2.65	.65	10.04	2.38	.57	9.66	2.12
33	Swit. G.	W	372	.72	7.08	2.64	.74	10.76	2.80	.50	9.73	2.06	.35	9.65	1.93
34															
35		M	237	.59	8.85	2.61	.73	10.83	2.81	.48	9.95	2.04	.46	9.81	2.08
36	Togo	W	200	.55	8.96	2.56	.41	12.52	1.88	.41	9.50	2.12	.33	9.66	1.63
37															
38		M	154	.48	8.42	2.50	.48	11.92	2.17	.40	8.76	2.02	.27	9.66	1.83
39	Tunisia	W	196	.57	7.89	2.85	.58	11.88	2.59	.60	10.44	2.64	.23	10.55	2.03
40															
41		M	196	.52	9.70	2.85	.54	12.11	2.52	.56	10.55	2.56	.32	10.37	2.16
42	USA	W	222	.74	6.58	2.60	.76	10.11	3.12	.77	7.93	2.62	.62	8.32	2.39
43															
44		M	216	.73	8.44	2.88	.70	10.39	2.72	.71	8.57	2.57	.49	8.61	2.19
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S-1. Level of invariance across the eighteen cultures for each personality factor.

ZKA-PQ/SF factor	χ^2	<i>df</i>	χ^2/df	CFI	TLI	RMSEA	$\Delta\chi^2$	Δdf	<i>p</i>	ΔCFI	ΔTLI	$\Delta RMSEA$
<i>Aggressiveness</i>												
Configural invariance	808.45	288	2.81	.981	.967	.013						
Metric invariance	1354.69	356	3.81	.964	.949	.017	546.24	68	< .001	.017	.018	.004
Scalar invariance	8027.20	492	16.32	.726	.719	.039	6672.51	136	< .001	.238	.230	.022
<i>Activity</i>												
Configural invariance	1710.37	288	5.94	.934	.885	.022						
Metric invariance	1953.84	356	5.49	.925	.894	.021	243.47	68	< .001	.009	< .001	< .001
Scalar invariance	8837.90	492	17.96	.610	.600	.041	6884.06	136	< .001	.315	.294	.020
<i>Extraversion</i>												
Configural invariance	1021.82	288	3.55	.969	.945	.016						
Metric invariance	1229.96	356	3.46	.963	.947	.015	208.14	68	< .001	.006	< .001	< .001
Scalar invariance	5109.59	492	10.39	.804	.799	.030	3879.63	136	< .001	.159	.148	.015
<i>Neuroticism</i>												
Configural invariance	1021.20	288	3.55	.975	.956	.016						
Metric invariance	1278.91	356	3.59	.968	.955	.016	257.71	68	< .001	.007	.001	< .001
Scalar invariance	5114.65	492	10.40	.841	.837	.030	3835.74	136	< .001	.127	.118	.014
<i>Sensation Seeking</i>												
Configural invariance	645.22	288	2.24	.980	.964	.011						
Metric invariance	986.92	356	2.77	.964	.949	.013	341.70	68	< .001	.016	.015	.002
Scalar invariance	4737.06	492	9.63	.758	.752	.029	3750.14	136	< .001	.206	.197	.016

Note. ZKA-PQ/SF = Zuckerman-Kuhlman-Aluja Personality Questionnaire shortened form; CFI = Comparative Fit Index;

TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation.

S-2. Correlations with age and sex differences for each personality factor and each culture.

Sub-sample	Correlations with age controlling for gender					Sex differences controlling for age (partial η^2)							
	AG	AC	EX	NE	SS	AG	AC	EX	NE	SS			
Belgium	-.18 ***	.15 **	-.16 **	-.15 **	-.35 ***	<.001	.037	.011	.004 <.001	.069 <.001	.113 <.001		
Bosnia H.	.09	.02	-.13 **	.03	-.03	.005	.017	.003	.003	.000	.000		
Catalonia	-.20 ***	.10 **	-.22 ***	.07	-.42 ***	.004	.012	.001	.021	.008 <.001	.039 <.001	.030	
Chile	.07	.16 **	.04	.11 *	-.02	.009	.002	.000	.005	.000	.000		
China	.11 **	.05	-.14 ***	-.04	-.03	.004	.001	.000	<.001	.027	.002		
Germany	-.14 **	.07	-.22 ***	-.13 ***	-.36 ***	.002	.013	.001	<.001	.031	.001	.064 <.001	.061 <.001
Hungary	-.32 ***	.12 **	-.03	-.31 ***	-.33 ***	.000	<.001	.034	.001	<.001	.063 <.001	.010	.011
Israel	-.15 **	.05	-.15 **	-.10	-.18 **	.006	.003	.050	.015	.002	.035 <.001	.074 <.001	
Italy	-.04	.04	-.07	-.06	-.27 ***	<.001	.049	.054	.009	.001	<.001	.068 <.001	.071 <.001
Poland	-.17 ***	-.00	-.14 ***	-.15 ***	-.14 ***	.000	.000	.001	<.001	.061	<.001	.034	
Qatar	-.17 ***	-.03	.08 *	-.11 ***	-.39 ***	.001	.002	.000	.003	.011	<.001	.017	
Senegal	--	--	--	--	--	.023	.003	.001	.000	<.001	.022	<.001	.015
Spain	-.24 ***	.05	-.16 ***	-.09 **	-.51 ***	.002	.002	.002	<.001	.046	<.001	.015	
SwitzerF	-.17 **	.05	-.14 *	-.22 ***	-.21 ***	.000	.000	.003	<.001	.093 <.001	.092 <.001		
SwitzerG	-.15 ***	.09 *	-.18 ***	-.26 ***	-.30 ***	.000	.004	.005	<.001	.058	<.001	.033	
Togo	-.24 ***	.03	.13 *	-.33 ***	-.21 ***	.003	.018	.016	.001	.009	.019	<.001	.045
Tunisia	-.16 ***	.16 **	-.04	.01	-.44 ***	.000	.044	.010	.002	<.001	.035	.003	.023

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US	-.28	***	-.05		.15	**	-.28	***	-.24	***	.009	.016	.004	.034	.010	.001	<.001	.037	
<i>Total</i>	-.16	***	.07	***	-.05	***	-.13	***	-.28	***	<.001	.001	.000	<.001	.002	<.001	.017	<.001	.011

Note. **p* < .05; ** *p* < .01; *** *p* < .001. Correlations equal to or above .30 and partial η^2 equal or above .0588 are given in boldface type. Correlations with age were computed controlling for gender; and gender differences were computed controlling for age. AG = Aggressiveness; AC = Activity; EX = Extraversion; NE = Neuroticism; SS = Sensation Seeking.

For Peer Review

S-3. Personality variance accounted (adjusted R²) by age and sex after linear regression analysis.

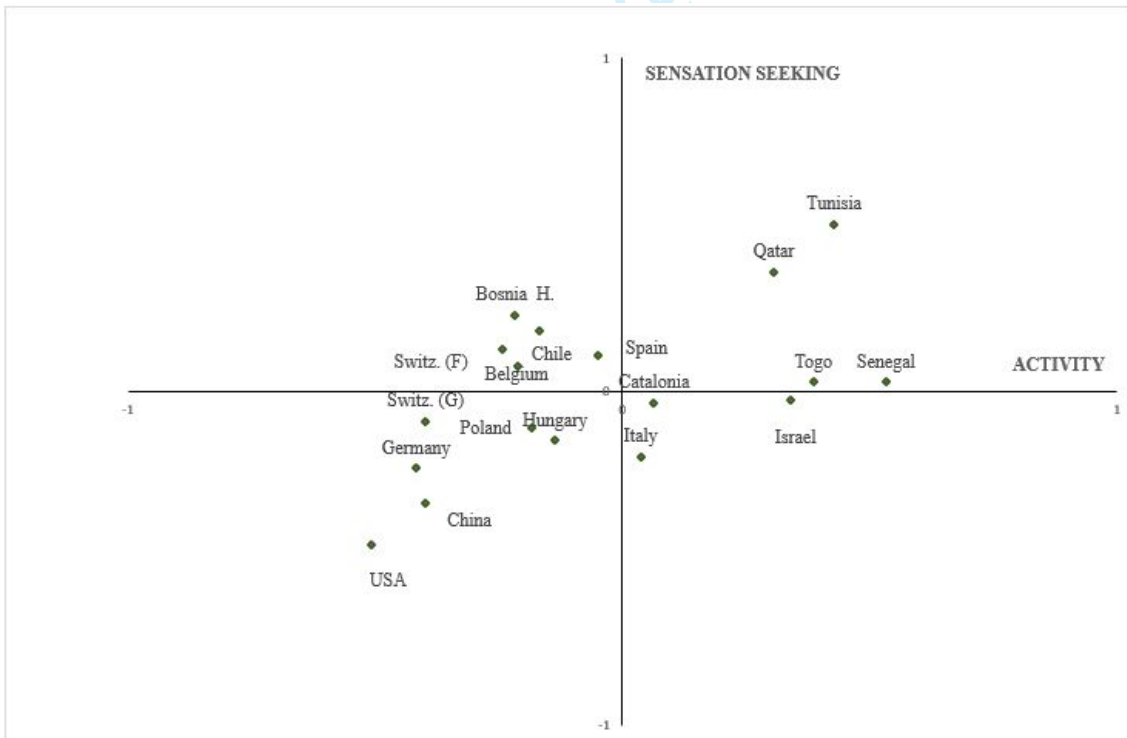
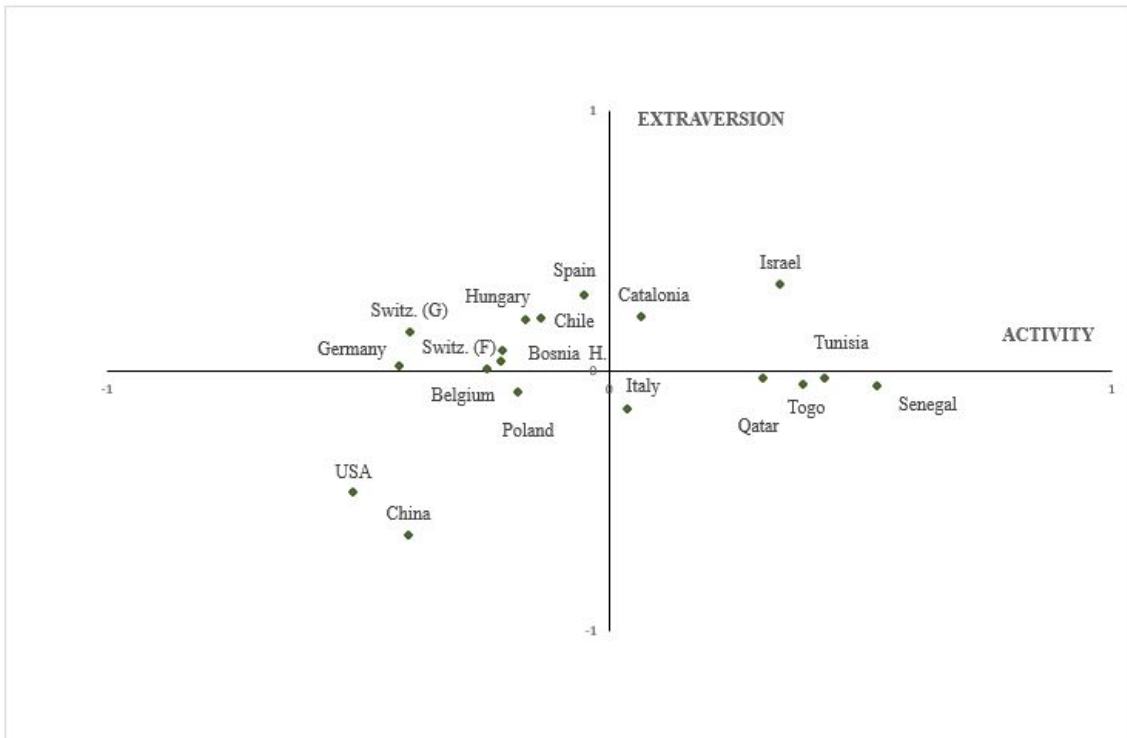
	SS		AG		AC		NE		EX	
	Age	Sex	Age	Sex	Age	Sex	Age	Sex	Age	Sex
Belgium	.108	.098	.032	.033	.011	.007	.026	.064	.017	.001
Bosnia	.001	-.002	.003	.015	-.002	.001	-.001	-.002	.012	.001
Catalonia	.147	.024	.034	.010	.009	.000	.003	.037	.034	.006
Chile	-.002	-.002	-.001	.006	.024	.000	.009	.002	-.001	-.002
China	-.001	.001	.012	.003	.003	-.001	-.001	.025	.011	-.002
Gernany	.112	.052	.018	.011	.001	-.001	.017	.062	.051	.029
Hungary	.095	.007	.093	-.001	.006	.031	.093	.061	-.002	-.001
Israel	.017	.069	.012	.002	.001	-.001	.003	.032	.020	.010
Italy	.054	.058	-.002	.046	-.002	.006	.004	.067	.001	-.002
Poland	.004	.026	.023	-.001	-.002	-.002	.035	.072	.017	-.002
Qatar	.141	.013	.033	.001	.000	.001	.017	.010	.006	-.001
Senegal	.004	.014	.000	.003	-.001	.000	-.001	.021	.000	.000
Spain	.244	.004	.052	.000	.000	.001	.008	.047	.021	.002
Suitz_French	.028	.079	.021	-.003	-.002	-.003	.040	.094	.016	.000
Suitz_German	.083	.024	.012	-.001	.003	.002	.057	.059	.034	.005

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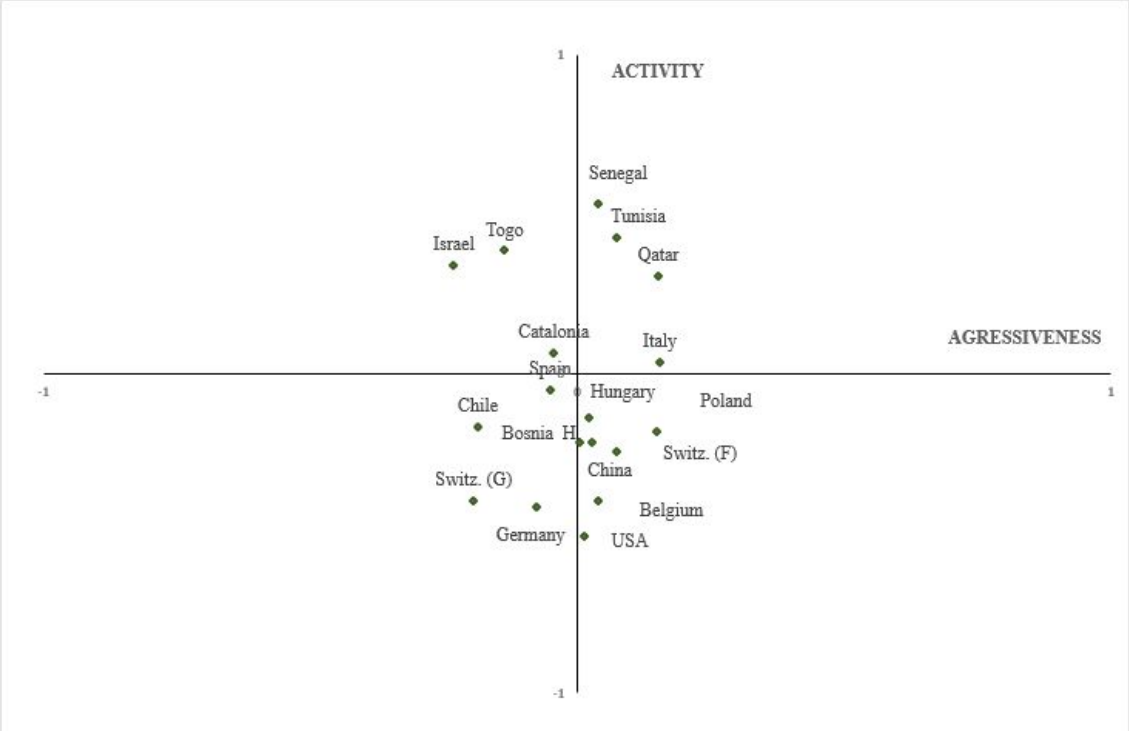
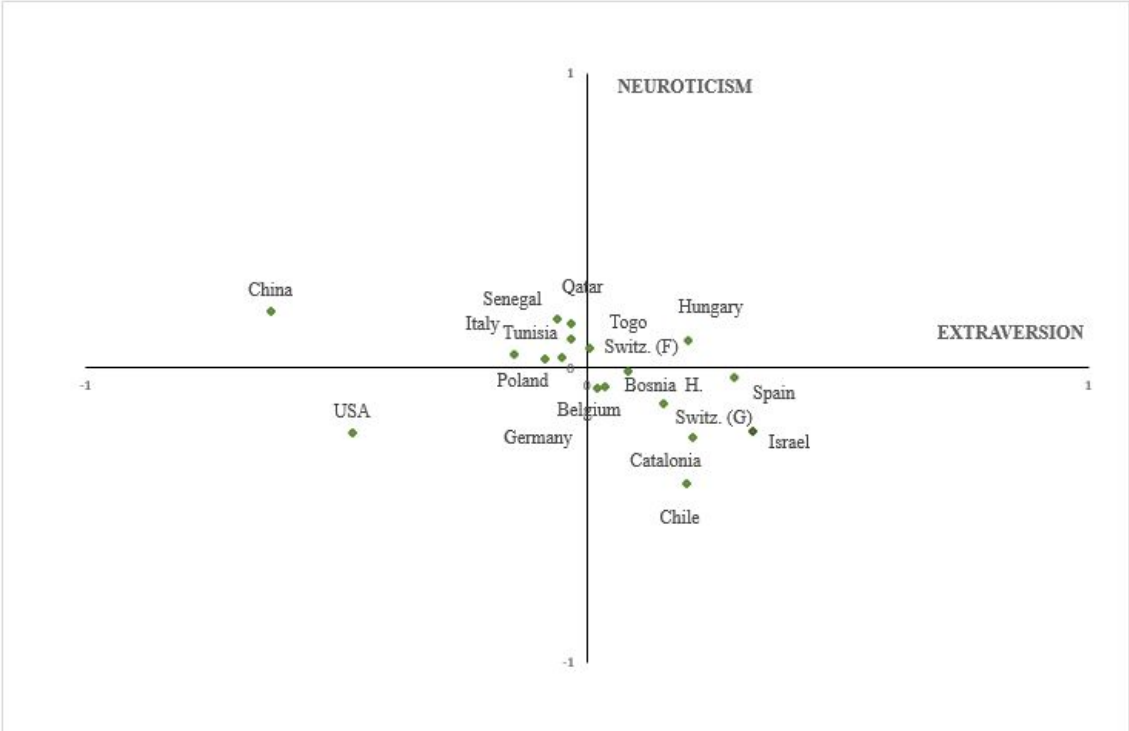
Togo	.020	.030	.044	.005-.002	.014	.082	.030	.013	.000	
Tunis	.177	.017	.026-.002	.026	.007-.003	.033-.001-.001				
US	.055	.033	.078	.014	.001	.002	.078-.002	.019	.009	
<i>Average</i>	<i>.072</i>	<i>.030</i>	<i>.027</i>	<i>.008</i>	<i>.004</i>	<i>.004</i>	<i>.026</i>	<i>.040</i>	<i>.015</i>	<i>.003</i>

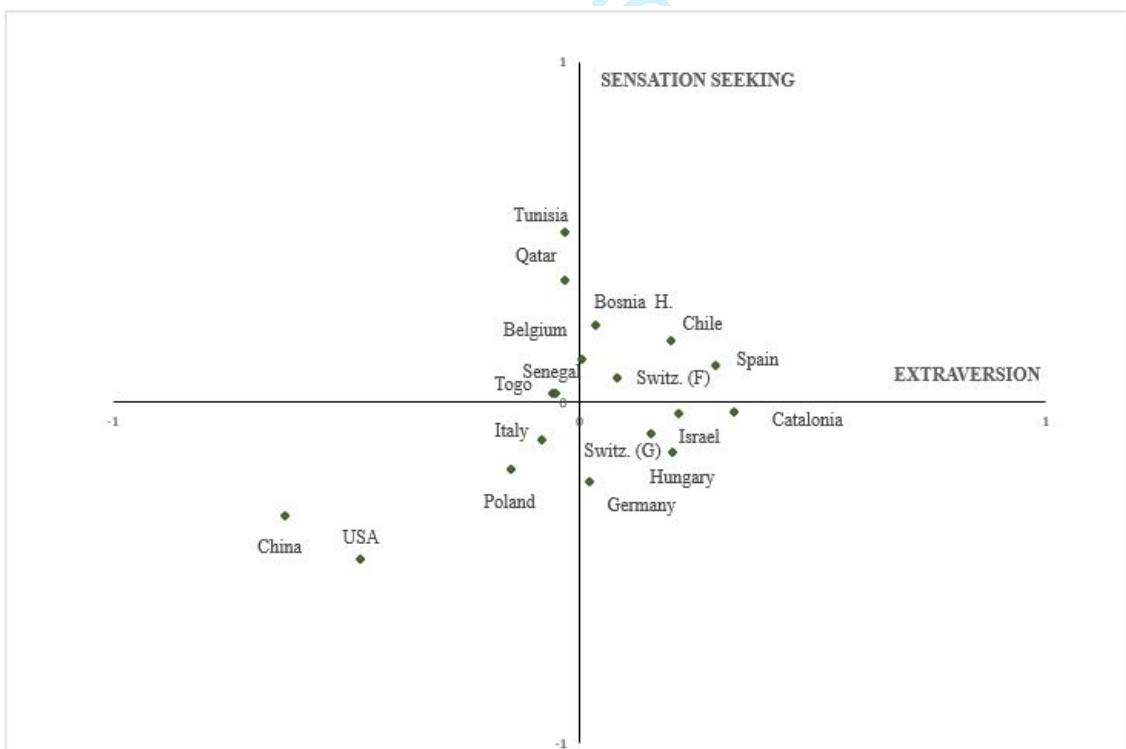
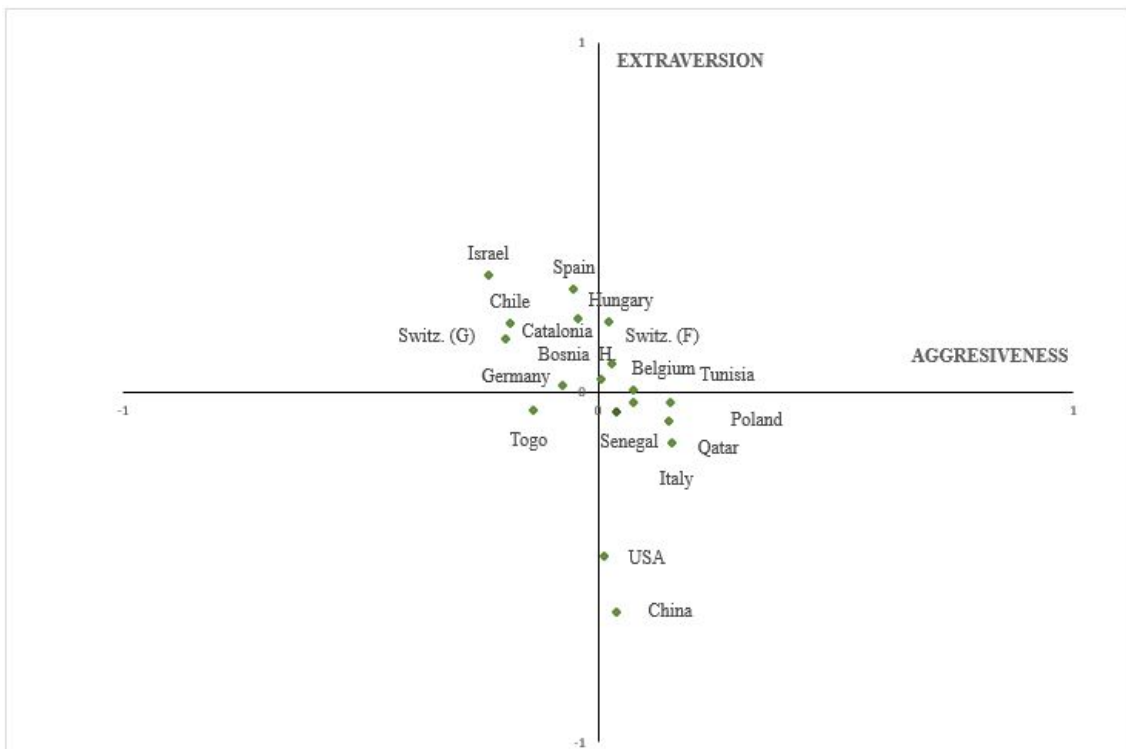
For Peer Review

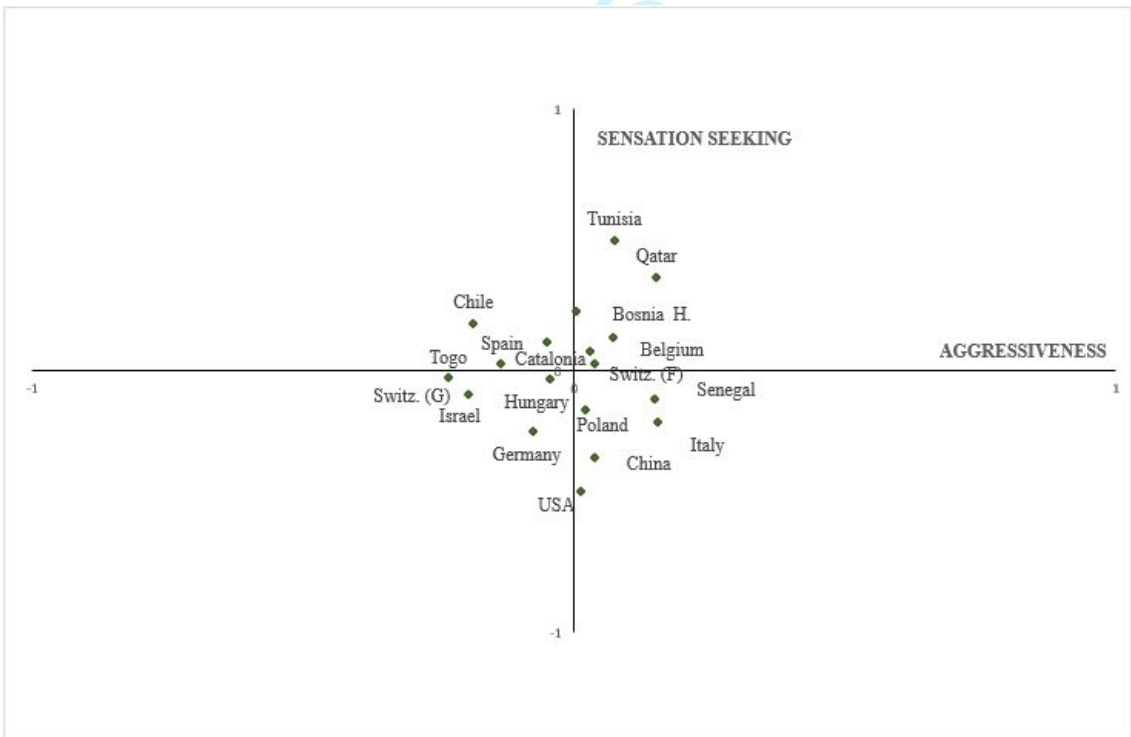
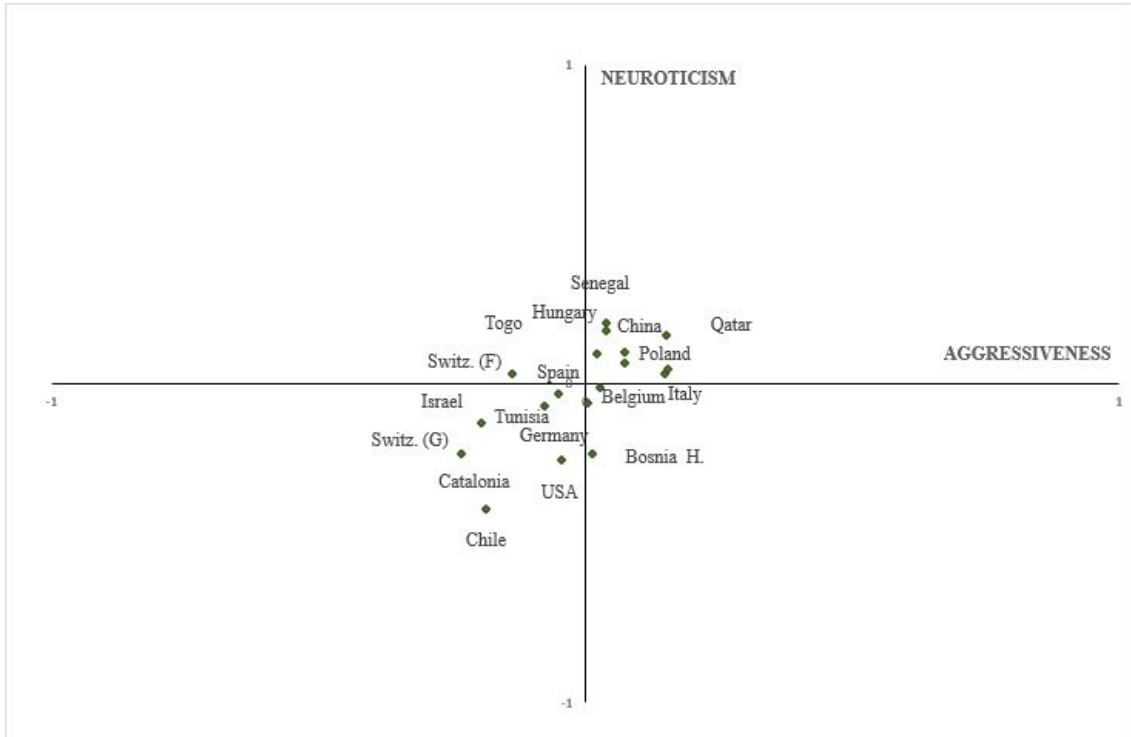
Figures combined the location of cultures in two personality quadrants according to normalized z-scores.



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