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Corresponding Author: Prof. Anton Aluja,

Corresponding Author's Institution:

First Author: Anton Aluja, Ph.D.

Order of Authors: Anton Aluja, Ph.D.; Sergio Escorial, Ph.D.; Luís F García, Ph.D.; Oscar García, Ph.D.; Angel Blanch, Ph.D.; Marvin Zuckerman, Ph.D.

Abstract: The aim of this study was to explore the relationships of the dimensions and facets of the Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ) with others psychobiological personality measures as the EPQ-RS (Eysenck Personality Questionnaire Revised, shortened version), I7 (Impulsiveness Questionnaire) and SPSRQ-20 (Sensitivity to Punishment and Sensitivity to Reward Questionnaire, 20-item version). It is intended to test if findings reported with Zuckerman's previous instrument (ZKPQ) about the relationships between the three biologic-factorial personality models are replicated, giving evidences about the validity of the ZKA-PQ. The sample analyzed was of 584 subjects (50.3 % men and 49.7 % women) from the Spanish general population. Correlational and factor analysis supported the expected relationships between similar constructs assessed by the ZKA-PQ and the other questionnaires based on Eysenck's and Gray's personality theories. On the other hand, the inclusion of the facets from the ZKA-PQ improved the validity of the questionnaire. Findings were discussed in the framework of the biological personality models, emphasizing the contribution of the ZKA-PQ to the psychobiological personality research, including personality disorders.

Dear Sir/Madam:

We are pleased to submit the manuscript entitled: “Analysis of the Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ) and its relationship with Eysenck’s and Gray’s personality models”, for consideration at Personality and Individual Differences.

Yours sincerely,

Anton Aluja  
University of Lleida (Spain )

Count: 4913 (abstract+text+references+tables)

This manuscript has not been submitted to another journal.

Reanalysis of Eysenck's, Gray's and Zuckerman's psychobiological personality models based in a new Zuckerman's measure: The Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ).

Anton Aluja<sup>1,2</sup>, Sergio Escorial<sup>3</sup>, Luis F. García<sup>4,2,5</sup>, Óscar García<sup>6</sup>, Ángel Blanch<sup>1,2</sup> and Marvin Zuckerman<sup>7</sup>

<sup>1</sup>University of Lleida (Spain)

<sup>2</sup>Institute of Biomedical Research of Lleida (Spain)

<sup>3</sup>Complutense University of Madrid (Spain)

<sup>4</sup>Autonomous University of Madrid (Spain)

<sup>5</sup>Institute of Forensic Sciences (UAM)

<sup>6</sup>European University of Madrid (Spain)

<sup>7</sup>University of Delaware (USA)

Correspondence concerning this article should be addressed to Anton Aluja.

Department of Psychology.

University of Lleida.

Complex de la Caparrella, s/n.

25192 Lleida (Catalonia) Spain

e-mail: aluja@pip.udl.cat

Results showed a good convergent and discriminant validity and reliability of the ZKA-PQ.

The ZKA-PQ assessed similar constructs of Eysenck's and Gray's personality theories.

The inclusion of the facets from the ZKA-PQ improved the validity of the questionnaire

Findings we discussed in the framework of the biological personality models.

**Summary:** The aim of this study was to explore the relationships of the dimensions and facets of the Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ) with others psychobiological personality measures as the EPQ-RS (Eysenck Personality Questionnaire Revised, shortened version), I<sub>7</sub> (Impulsiveness Questionnaire) and SPSRQ-20 (Sensitivity to Punishment and Sensitivity to Reward Questionnaire, 20-item version). It is intended to test if findings reported with Zuckerman's previous instrument (ZKPQ) about the relationships between the three biologic-factorial personality models are replicated, giving evidences about the validity of the ZKA-PQ. The sample analyzed was of 584 subjects (50.3 % men and 49.7 % women) from the Spanish general population. Correlational and factor analysis supported the expected relationships between similar constructs assessed by the ZKA-PQ and the other questionnaires based on Eysenck's and Gray's personality theories. On the other hand, the inclusion of the facets from the ZKA-PQ improved the validity of the questionnaire. Findings were discussed in the framework of the biological personality models, emphasizing the contribution of the ZKA-PQ to the psychobiological personality research, including personality disorders.

**Keywords:** ZKA-PQ, EPQ-RS, I<sub>7</sub>, SPSRQ-20, alternative five factors, biologic-factorial personality models.

## INTRODUCTION

A review of the specialized literature in personality psychology published at the beginning of the XXI century shows that the discipline has a good position (see Boyle, Matthews & Saklofske, 2008). Most of the current personality studies are designed within the dominant model: The Five Factor Personality Model (FFM). However, the FFM comes from the lexical approach for the study of personality (De Raad, 2000; John, 1990), so it is a taxonomic model and does not provide a causal explanation of individual differences in personality. On the contrary, other personality models as Eysenck, Gray and Zuckerman's provide a biological explanation of individual differences on personality.

Focusing on the latter, Zuckerman, Kuhlman and Camac (1988), Zuckerman, Kuhlman, Thornquist and Kiers (1991), and Zuckerman, Kuhlman, Teta, Joireman, and Kraft (1993), developed the alternative five factor personality model formed by Impulsive Sensation Seeking, Aggression-Hostility, Activity, Sociability, and Neuroticism-Anxiety. This model has been mainly assessed with the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ; Zuckerman, et al., 1993). Different cross-cultural studies have endorsed the universality of the alternative five factors (Aluja, Rossier, García, Angleitner, Kuhlman, & Zuckerman, 2006; Rossier, Aluja, García, Angleitner, De Pascalis, Wang, Kuhlman & Zuckerman, 2007; Wu, Wang, Du, Jianh & Wang, 2000). The ZKPQ has also showed strong relationships with the DSM-IV Personality Disorders (Aluja, García, Cuevas & García, 2007, Wang, Du, Wang, Livesley, & Jang, 2004).

Recently, Aluja, Kuhlman and Zuckerman (2010) have developed a new instrument based on the Zuckerman's personality model, with the purpose to overcome some limitations of the ZKPQ. The Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ) has 200 items with a Lykert type answer format (Aluja et al., 2010). This new instrument has the main advantage over the ZKPQ of including four facets by each personality dimension. The five factors are basically the same of the ZKPQ, except some changes produced by the facets content. In this way, 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 to Extraversion in the ZKA-PQ, being Sociability one of the facets of this new factor. On the other hand, the Neuroticism factor has included new facets which are different to the Anxiety construct, so the new factor has been named Neuroticism. Therefore, the factors of the new questionnaire were: Neuroticism (NE), Extraversion, (EX), Activity (AC), Aggressiveness (AG) and Sensation Seeking (SS).

The relations between the old ZKPQ and the Eysenck's Personality Questionnaire (EPQ) have been analyzed in Zuckerman et al., (1993), and Aluja, García, and García (2002; 2004), whereas the associations of the Sensation Seeking Scale with the Eysenck's Impulsiveness ( $I_7$ ), the Eysenck's Personality Questionnaire (EPQ) and the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ) were explored by Torrubia Avila, Moltó, and Caseras (2001). In the studies by Zuckerman et al. (1993) and Aluja et al., (2002), the Neuroticism-Anxiety (N-Anx) and the Sociability (Sy) of the ZKPQ were grouped together with Neuroticism and Extraversion of the EPQ, respectively. On the other hand, the Psychoticism scale of the EPQ was related with the Impulsive Sensation Seeking (ImpSS) and the Aggression-Hostility (Agg-Host) scales of the ZKPQ. In the Torrubia et al.,'s study (2001) the Sensitivity to the Punishment (SP) correlated positively with Neuroticism (N; 0.62/0.53) and negatively with the Extraversion of the EPQ (E; -0.53/-0.48) in men and women, respectively, and the Sensitivity to Reward (SR) scale correlated with Extraversion (E; 0.41/0.37) and Impulsiveness ( $I_5$ ; 0.41/0.43) and, in a lesser extent, with Neuroticism (N; 0.33/0.25) and Psychoticism (P; 0.24/0.19) of the EPQ. Besides, Sensitivity to Reward (SR) correlated with Sensation Seeking measured through the SSS-V (0.45/0.36).

More recently, Aluja and Blanch (2011) analyzed the SPSRQ (complete and short version), the  $I_7$ , BIS-10 and the ZKPQ. After controlling for the effect of age and sex, SR



correlated 0.39/-0.31 with Impulsiveness Sensation Seeking (ImpSS), for males and females, respectively. Besides, ImpSS was negatively correlated with Venturesomeness ( $I_7$ ; -0.35/-0.33), whereas SP correlated 0.67/0.67 with Anxiety, and 0.37/0.34 with Empathy ( $I_7$ ). The Impulsiveness of the  $I_7$  correlated 0.40/0.30 with SR in both short and long versions of this instrument.

Considering previous evidences, the relationships of the ZKA-PQ with the EPQ,  $I_7$ , and SPSRQ-20 are expected to be very similar to those reported using the ZKPQ provided that factors of both questionnaires are quite equivalent regarding its core content. The main difference comes from the inclusion of facets in the ZKA-PQ. In spite of the fact that facets are interrelated, they can present some differences in their relations with other questionnaires. For example, it is expected that the first two facets of the Aggressiveness factor (Physical and Verbal) will relate in a greater extent with Psychoticism, whereas the next two facets (Anger and Hostility) will relate mainly with Neuroticism. Moreover, it is expected that the Physical and Verbal Aggressiveness facets obtained higher correlations with Venturesomeness and Impulsiveness of the  $I_7$ . Considering that Activity factor of the ZKPQ was related to Extraversion, positive relationships are expected between the four facets of Activity (AC) and the Extraversion (E) scale of the EPQ. Extraversion facets (EX) of the ZKA-PQ should correlate positively with the Extraversion scale, and Neuroticism facets should be positively correlated with Neuroticism from the EPQ, and Sensitivity to Punishment (SP) of the SPSRQ. Finally, the four Sensation Seeking facets (SS) should show positive correlations with Extraversion and Psychoticism of the EPQ, Impulsiveness and Venturesomeness of the  $I_7$ , and Sensitivity to the Reward (SR) of the SPSRQ.

The present study was designed to test if the new instrument presented a similar pattern of relationships reported in previous studies between the ZKPQ and the instruments developed after the Eysenck's and Gray's personality models, as well as to explore the relationships between Eysenck's and Gray's constructs and the new facets developed for the ZKA-PQ.

## METHOD

### *Subjects*

The total sample was composed by 584 subjects (294 males and 290 women). The average age was 44.70 (s.d.: 18.26; range 18-92) for males, and 44.30 (s.d.: 18.82; range 18-92) for females. The subjects were recruited among the general population, and were anonymous volunteers. A trained group of students collaborated in the data collection. The students had instructions to obtain one man and one woman in each of the following age subgroups: 18-29, 30-39, 40-49, 50-59, and >60. The final sex distribution of the sample was composed of 50.3% male participants and 49.7% females, with an equivalent number of male and females across all age ranges.

### *Measures*

#### *Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ)*

The ZKA-PQ (Aluja, et al., 2010) measures five personality dimensions: Sensation Seeking (SS), Neuroticism (NE), Aggressiveness (AG) Activity (AC) and Extraversion (EX). The item response format is a 4-point Liker-type scale in which 1= *Disagree Strongly*, 2= *Disagree Somewhat*, 3= *Agree Somewhat*, and 4= *Agree Strongly*. The factor structure is based on 20 facets of 10 items. Only 16 items of the old ZKPQ were included in the new ZKA-PQ. Each dimension has four facets: *Sensation Seeking* (SS): SS1 (Thrill and Adventure Seeking), SS2 (Experience Seeking), SS3 (Disinhibition), and SS4 (Boredom Susceptibility/Impulsivity); *Neuroticism* (NE): NE1 (Anxiety), NE2 (Depression), NE3 (Dependency) and NE4 (Low Self-Esteem); *Aggressiveness* (AG): AG1 (Physical Aggression), AG2 (Verbal Aggression), AG3 (Anger) and AG4 (Hostility); *Extraversion* (EX): EX1 (Positive Emotions), EX2 (Social Warmth), EX3 (Exhibitionism) and EX4 (Sociability); *Activity* (AC): AC1 (Work Compulsion), AC2 (General Activity), AC3 (Restlessness) and AC4 (Work Energy).

In the original validation study, the ZKA-PQ obtained good construct, convergent and discriminant validity. Alphas for the dimension scales were around 0.87 in American and Spanish samples. The 10-item facets had an average alpha of 0.75 and 0.76 (Spanish and American samples, respectively; Aluja et al., 2010).

*Eysenck Personality Questionnaire–Revised Shortened version (EPQ-RS)*

The Spanish short version of the EPQ-RS (Eysenck & Eysenck, 1997) was used. The short version of the EPQ-RS has 48 items and four scales, each of them integrated by 12 items, E: Extraversion; N: Neuroticism; P: Psychoticism and L: Lie. Reliability alpha coefficients range between 0.73 and 0.82 (Aluja et al., 2002; Eysenck & Eysenck, 1997). The lie scale was not used in this research. Psychometric properties were similar to those obtained in the original English language studies.

*Eysenck's Impulsiveness, Venturesomeness and Empathy Questionnaire (I<sub>7</sub>)*

The I<sub>7</sub> is a questionnaire with a yes/no response format and it includes three scales: Impulsiveness (I-I<sub>7</sub>), Venturesomeness (V-I<sub>7</sub>), and Empathy (E-I<sub>7</sub>) (Eysenck, Pearson, Easting & Allsopp, 1985). In this study, we used the short version of I<sub>7</sub> that includes 24 items, 8 items for each scale (Aluja & Blanch, 2007). The alphas for I-I<sub>7</sub>, V-I<sub>7</sub> and E-I<sub>7</sub> in the present sample were 0.76, 0.87 and 0.62 for males, and 0.77, 0.88 and 0.62 for females, respectively. Those results are consistent with Aluja and Blanch (2007).

*Sensitivity to Punishment and Sensitivity Reward Questionnaire (SPSRQ-20)*

We used the short version of Sensitivity to Punishment and Sensitivity Reward Questionnaire (SPSRQ; Torrubia, Avila, Moltó & Caseras, 2001) validated in Spanish by Aluja and Blanch (2011) that includes 20 items, 10 items for each scale: Sensitivity to Punishment (SP) and Sensitivity to Reward (SR). The SPSRQ-20 maintains essentially the content validity,

structural validity, orthogonality, and reliability of the longer SPSRQ version. The SP and SR alpha reliabilities ranged between 0.70 and 0.80 in different samples. This short version has a Likert type answer format with four options.

## RESULTS

Table 1 shows the correlation matrix between the facets and dimensions of the ZKA–PQ and the dimensions of EPQ-RS, I<sub>7</sub> and SPSRQ-20. According to previous findings, positive and negative correlations between the ZKA–PQ and other personality measures considered were predicted. Those predictions are shown in Table 1. Summing up, we expected higher positive or negative correlations of AG with N, P, I-I<sub>7</sub>, V-I<sub>7</sub>, E-I<sub>7</sub> (-) and SR; AC with E; EX with E, N (-), I-I<sub>7</sub>, SR and SP (-); NE with E (-), N, V-I<sub>7</sub> (-) and SP; and SS with E, P, I-I<sub>7</sub>, V-I<sub>7</sub>, SR and SP (-). Correlations were generally consistent with those reported in earlier works using the original ZKPQ as a measure of the Zuckerman's personality model traits (Aluja et al., 2002, 2010; Zuckerman et al., 1993).

A similar pattern of correlations is expected for each group of four facets from the ZKA–PQ. Nevertheless, although the facets were highly intercorrelated, variations among them in the range of correlations with the scales of the EPQ-RS, I<sub>7</sub> and SPSRQ-20 are possible due to differences in the content. In this way, it is no surprising that Anger and Hostility facets (AG3 and AG4, respectively) showed a stronger relationship with N than AG1 and AG2, whereas the last two correlated higher with Psychoticism.

Extraversion facets correlated positively with EPQ-RS Extraversion, and negatively with Sensitivity to Punishment. All Neuroticism facets presented high correlations with EPQ-RS Neuroticism and Sensitivity to Punishment. As the dimension, the Activity facets correlate with no construct except to the positive relationship between Restlessness (AC3) and Impulsivity. In regard to the Sensation Seeking facets, they correlate with Extroversion from EPQ-RS, Impulsivity and Venturesomeness from I<sub>7</sub> and Sensitivity to Reward from SPSRQ-20.

However, it is observed a different profile of relationships for some facets. For instance, Boredom Susceptibility/Impulsivity (SS4) correlates lower than the other three facets with Extroversion and Venturesomeness, but it has a strong relationship with Psychoticism and Impulsivity. Another example is the correlation between SR and the Extroversion facets. While SR is highly correlated with EX3 (Exhibitionism;  $0.45; p < 0.001$ ), the correlations with EX1 (Positive emotions) and EX2 (Social Warmth) were around zero.

*Factor analysis of ZKA-PQ, EPQ-RS, I<sub>7</sub> and SPSRQ-20*

To explore the relationship between the ZKA-PQ facets and the EQP-RS, I<sub>7</sub>, and SPSRQ-20 scales, a five factor solution considering those variables was obtained. The total variance explained by the five factors solution was 55.39% (Table 2). The first factor was formed by the four facets of Aggressiveness from ZKA-PQ plus the Sensitivity to Reward scale from SPSRQ-20. This factor had the following secondary loadings: Psychoticism (0.35), Impulsivity and Empathy (0.35 and -0.30, respectively). Exhibitionism (EX3) and Boredom Susceptibility/Impulsivity (SS4) facets also loaded on this factor. The second factor was defined by positive loadings of the four facets of Activity from ZKA-PQ only. The third factor was integrated by the extraversion facets of ZKA-PQ and the Eysenck's Extraversion scale. The Empathy (E-I<sub>7</sub>) scale from I<sub>7</sub> had also its largest loading on this factor (0.37). The fourth factor was formed by the four facets of Neuroticism (NE) from ZKA-PQ together with the Neuroticism (N) from EPQ-RS (0.68) and Sensitivity to Punishment (SP) from SPSRQ-20 (0.67). This factor also presented a negative secondary loading of EX1 (Positive Emotions) from the ZKA-PQ (-0.46). Finally, the fifth factor was defined by the four facets of Sensation Seeking (SS) from ZKA-PQ, Impulsivity (E-I<sub>7</sub>) and Venturesomeness (V-I<sub>7</sub>) from I<sub>7</sub>, and Psychoticism (P) from EPQ-RS. All these loadings were positive and ranged from 0.44 to 0.79. This factor shows also positive loadings of Sensitivity to Reward (SR) from SPSRQ-20 (0.37) and Extraversion (E) from EPQ-RS (0.37).

## DISCUSSION

The main aim of this work was to analyze the relationship of the new questionnaire ZKA-PQ in regard to EPQ-RS, I<sub>7</sub> and SPSRQ-20 as measures of the Eysenck's and Gray's personality models. As expected, Physical and Verbal Aggression facets correlated positively with Psychoticism, Impulsivity, Venturesomeness and Sensitivity to Reward, but Anger and Hostility correlated more with Neuroticism. Extraversion facets were positively correlated with EPQ-RS Extraversion, and negatively with Sensitivity to Punishment. In detail, the Positive Emotions (EX1) facet showed strong negative correlations with Neuroticism and Sensitivity to Punishment, Social Warmth (EX2) correlates with Empathy, and Exhibitionism (EX3) with Sensitivity to Reward. Neuroticism facets presented a pattern of correlations very similar with EPQ-RS Neuroticism and Sensitivity to Punishment. The Sensation Seeking facets correlated with EPQ-RS Extraversion, Psychoticism, I<sub>7</sub> Impulsivity and Venturesomeness and Sensitivity to Reward. It should be mentioned that Boredom Sensitivity/Impulsiveness obtained higher correlations with Psychoticism and Impulsivity than with EPQ-RS Extraversion. This result may be explained by the fact that this facet contains 6 out of 10 items of Lack of Premeditation from the UPPS (Impulsive Behaviour Scale; Lynam, Smith, Whiteside & Cyders, 2006). In general, the correlations support the predicted relationships.

The factor analysis performed with all ZKA-PQ facets, EPQ-RS, I<sub>7</sub> and SPSRQ-20 scales confirmed the relationship between the Alternative Five of the ZKA-PQ and the remaining instruments. Extraversion and Neuroticism from EPQ-RS grouped with Extraversion and Neuroticism factors, respectively. Sensitivity to Reward loaded on the Aggressiveness and Sensation Seeking factors, and Sensitivity to Punishment loaded on the Neuroticism factor. Psychoticism, Impulsivity and Venturesomeness mainly load on the Sensation Seeking factor.

The three personality models investigated in the present study share the psychobiological approach to the explanation of individual differences in personality. They

have served as useful theoretical foundations of the large amount of studies about the biological bases of personality. For instance, they have inspired many researches to explore the role of neurotransmitters, endocrine system, brain structures and genetics in the personality field. Recent examples might be the association of the shorter CAG alleles of the Androgen receptor exon 1 repeat polymorphisms with the Eysenck's Psychoticism scale (Loehlin, Medland, Montgomery, & Martin, 2005; Turakulov, Jorm, Jacomb, Tan & Easteal, 2004). On the other hand, optimized voxel-based morphometry was used to show a positive correlation between Sensitivity to Punishment scores and gray matter volume in the amygdala and the hippocampal formation (Barrós-Loscertales, Meseguer, Sanjuán, Belloch, Parcet, Torrubia & Ávila, 2006b). Voxel-based morphometry analysis also revealed a negative correlation between Sensitivity to Reward scores and gray matter volume in the dorsal striatum and prefrontal cortex, suggesting that a reduced volume in the striatum might be associated with enhanced reward sensitivity and deficits in inhibitory control (Barrós-Loscertales, Meseguer, Sanjuán, Belloch, Parcet, Torrubia & Ávila, 2006a). A psychometric index of the impulsive-disinhibited personality traits formed by Psychoticism, Impulsive Sensation Seeking, Aggression-Hostility, Sensitivity to Reward and Novelty Seeking was associated with carrying one or two copies of the 5-HTTLR S allele, and carrying two copies of the 5-HTTVNTR 12 allele in inmates (Aluja, García, Blanch, De Lorenzo & Fibla, 2009). A similar personality index was associated with CAG short (S) and GGN long (L) haplotype group (S-L haplotype) of AR gene in the same sample of inmates (Aluja, García, Blanch & Fibla, 2011) or testosterone levels (Aluja & García, 2005). In this context, the results of the present study may be helpful to suggest appropriate psychobiological hypothesis at the psychological level, considering the inclusion of facets, to understand the contributions of the conducted studies or to propose alternative implications.

Summing up, the ZKA-PQ has good psychometric properties as well as an appropriate and stable factor structure as demonstrated in the original (Aluja et al., 2010) and further studies with different samples (Escorial, Aluja, García, García, & Blanch, *submitted for*

*publication*; García, Aluja, García, Escorial, & Blanch, *in press*; García, Escorial, García, Blanch, & Aluja, 2012). In the present study, the dimensions assessed after the ZKA-PQ have replicated the relationships with Eysenck's and Gray's constructs (as measured through the EPQ-RS, I<sub>7</sub> and SPSRQ-20) reported in previous studies using the ZKPQ and SSS-V. Notice that the ZKA-PQ of 200-items only has a 16 items of the old ZKPQ (89-items). On the other hand, the usefulness of the facets is confirmed since the different profile of relationships observed for the facets of the same trait may give invaluable information about the psychological correlates of the considered dimensions. Maybe the main support for this fact is represented by the differences in the correlations pattern of Physical and Verbal Aggression compared to the other two facets of Aggressiveness (Anger and Hostility), and the differences between the Sensation Seeking facets. In this way, the ZKA-PQ dimensions and facets have showed an important power to predict personality disorders (Aluja, Blanch, García, García, & Escorial, *in press*), so they can be used in future studies to obtain cut-off values for screening of personality disorders similar to the study performed with the DAPP-BQ (De Beurs, Rinne, Van Kampen, Verheij & Andrea, 2010).



## REFERENCES

- Aluja, A. & Blanch, A. (2007). Comparison of impulsiveness, Venturesomeness and empathy (I<sub>7</sub>) structure in English and Spanish samples: analysis of different structural equation models. *Personality and Individual Differences, 43*, 2294-2305.
- Aluja, A. & Blanch, A. (2011). Neuropsychological Behavioral Inhibition System (BIS) and Behavioral Approach System (BAS) assessment: A Shortened Sensitivity to Punishment and Sensitivity to Reward Questionnaire version (SPSRQ-20). *Journal of Personality Assessment, 93*, 628-636.
- Aluja, A., & García, L.F. (2005). Sensation seeking, sexual curiosity and testosterone in inmates. *Neuropsychobiology, 51*, 28-33.
- Aluja, A., García, L.F., Blanch, A., De Lorenzo, D., & Fibla, J. (2009). Impulsive-desinhibited personality traits and serotonin transporter gene polymorphisms: Association study in an inmates sample. *Journal of Psychiatric Research, 43*, 906-914.
- Aluja, A., García, L.F., Blanch, A., & Fibla, J. (2011). Association of androgen-receptor gene, CAG and GGN repeat length and impulsive-disinhibited personality traits in inmates: The rol of short-long haplotype. *Psychiatric Genetics, 21*, 229-239.
- Aluja, A., Blanch, A., García, L.F., García, O., & Escorial, S. (*in press*). Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ) as a predictor of MCMI-III personality disorders scales. *Personality and Mental Health*.
- Aluja, A., García, L.F., Cuevas, L. & García, O. (2007). Zuckerman's personality model predicts MCMI-III personality disorders. *Personality and Individual Differences, 42*, 1311-1321.
- Aluja, A., García, O., & García, L. F. (2002). A comparative study of Zuckerman's three structural models for personality throught the NEO-PI-R, ZKPQ-III, EPQ-RS and Goldberg's 50-bipolar adjectives. *Personality and Individual Differences, 33*, 713-725.

- Aluja, A., García, O., & García, L.F. (2004). Replicability of the three, four and five Zuckerman's personality super-factors: exploratory and confirmatory factor analysis of the EPQ-RS, ZKPQ and NEO-PI-R. *Personality and Individual Differences, 36*, 1093-1108.
- Aluja, A., Kuhlman, M., & Zuckerman, M. (2010). Development of the Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ): A Factor/Facet version of the Zuckerman-Kuhlman personality questionnaire (ZKPQ). *Journal of Personality Assessment. 92*, 1-17.
- Aluja, A, Rossier, J., García, L.F, Angleitner, A., Kuhlman, D.M., & Zuckerman, M. (2006). A cross-cultural shortened form of the ZKPQ (ZKPQ-50-cc) adapted to English, French, German and Spanish languages. *Personality and Individual Differences, 41*, 619-628.
- Barrós-Loscertales, A., Meseguer, V., Sanjuán, A., Belloch, M.A., Parcet, R., Torrubia, R., & Ávila, C. (2006a). Striatum gray matter reduction in males with an overactive behavioral activation system. *European Journal of Neuroscience, 24*, 2071-2074.
- Barrós-Loscertales, A., Meseguer, V., Sanjuán, A., Belloch, M.A., Parcet, R., Torrubia, R., & Ávila, C. (2006b). Behavioral Inhibition System activity is associated with increased amygdala and hippocampal gray matter volume: A voxel-based morphometry study. *Neuroimage, 33*, 1011-1015.
- Boyle, G.J., Matthews, G., & Saklofske, D.H. (2008). *The SAGE handbook of personality theory and assessment*, Vol 1 and 2: Personality measurement and testing. Thousand Oaks, CA, US: Sage Publications, Inc.
- De Beurs, E., Rinne, T., Van Kampen, D., Verheul, R. & Andrea, H. (2010). Criterion-related validity of the DAPP-SF and its utility as a screener for personality disorders in outpatient care. *Personality and Mental Health, 4*(4), 271–283.
- De Raad, B. (2000). *The Big Five Personality Factors: The psycholexical approach to personality*. Seattle, WA: Hogrefe & Huber Publishers.

- Escorial, E., Aluja, A., García, L.F., García, O., & Blanch, A. (2012). Similarities between the Karolinska Personality Scales and the Zuckerman's Alternative Five Factor Model assessed through the new Zuckerman-Kuhlman-Aluja Personality Questionnaire. *Manuscript Submitted for publication.*
- Eysenck, H. J., & Eysenck, S. B. G. (1997). Eysenck Personality Questionnaire-Revised (EPQ-R) and short scale (EPQ-RS). Madrid: TEA Ediciones.
- Eysenck, S. B. G., Pearson, P. R., Easting, G., & Allsopp, F. J. (1985). Age norms for Impulsiveness, Venturesomeness and Empathy in adults. *Personality and Individual Differences*, 6, 613-619.
- García, O., Aluja, A., García, L.F., Escorial, S., Blanch, A. (*in press*). Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ) and Cloninger's Temperament and Character Inventory Revised (TCI-R): A comparative study. *Scandinavian Journal of Psychology*.
- García, L.F., Escorial, S., García, O., Blanch, A., & Aluja, A. (2012). Structural analysis of the facets and dimensions of the Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ) and the NEO-PI-R. *Journal of Personality Assessment*, 94(2), 156-163.
- John, O. (1990). The big five factor taxonomy: Dimensions of personality in the natural language and in questionnaires. In L.A.Pervin (ed.), *Handbook of personality theory and research* (pp. 66-100). New York: Guilford Press.
- Loehlin, J.C., Medland, S.E., Montgomery, G.W., & Martin, N.G. (2005). Eysenck's Psychoticism and the X-linked androgen receptor gene CAG polymorphism in additional Australian samples. *Personality and Individual Differences*, 39, 661-667.
- Lynam, D.R., Smith, G.T., Whiteside, S.P., & Cyders, M.A. (2006). *The UPPS-P: Assessing five personality pathways to impulsive behavior* (Technical Report). West Lafayette: Purdue University.
- Rossier, J., Aluja, A., García, L.F., Angleitner, A., De Pascalis, V., Wang, W., Kuhlman, M. &

- Zuckerman, M. (2007). The cross-cultural generalizability of Zuckerman's Alternative Five-Factor Model of personality. *Journal Personality Assessment*, 89 (2), 1-9.
- Torrubia, R., Avila, C., Moltó, J. & Caseras, X. (2001). The Sensitivity to Punishment and Sensitivity Reward Questionnaire (SPSRQ) as a measure of Gray's Anxiety and Impulsivity Dimensions. *Personality and Individual Differences*, 31, 837- 862.
- Turakulov, R., Jorm, A.F., Jacomb, P.A., Tan, X., & Easteal, S. (2004). Association of dopamine-B-hydroxylase and androgen receptor gene polymorphisms with Eysenck's P and other personality traits. *Personality and Individual Differences*, 37, 191-202.
- Wang, W., Du, W., Wang, Y., Livesley, W.J., & Jang, K.L. (2004). The relationship between the Zuckerman-Kuhlman Personality Questionnaire and traits delineating personality pathology. *Personality and Individual Differences*, 36, 155-162.
- Wu, Y.-X., Wang, W., Du, W.-Y., Li, J., Jiang, X.-F., & Wang, Y.H. (2000). Development of a Chinese version of the Zuckerman-Kuhlman Personality Questionnaire: Reliabilities and gender/age effects. *Social Behaviour and Personality*, 28, 241-250.
- Zuckerman, M., Eysenck, S.B.G., & Eysenck, H.J. (1978). Sensation Seeking in England and America: Cross-cultural, age, and sex comparisons. *Journal of Consulting and Clinical Psychology*, 46, 139-149
- Zuckerman, M., Kuhlman, D.M., & Camac, C. (1988). What lies beyond E and N? Factor analyses of scales believed to measure basic dimensions of personality. *Journal of Personality and Social Psychology*, 54, 96-107.
- Zuckerman, M., Kuhlman, D.M., Teta, P., Joireman, J., & Kraft, M. (1993). A comparison of three structural models of personality: The big three, the big five, and the alternative five. *Journal of Personality and Social Psychology*, 65, 757-768.
- Zuckerman, M., Kuhlman, D. M., Thornquist, M., & Kiers, H. (1991). Five (or three) robust questionnaire scale factors of personality without culture. *Personality and Individual Differences*, 12, 929-941.

Table 1. Predictions (*Pd*), Pearson correlations (*r*) between ZKA-PQ, EPQ-RS, I<sub>7</sub> and SPSRQ-20

	E-EPQ		N-EPQ		P-EPQ		I- I <sub>7</sub>		V- I <sub>7</sub>		E-I <sub>7</sub>		SR		SP	
	<i>r</i>	<i>pd</i>	<i>r</i>	<i>pd</i>	<i>r</i>	<i>pd</i>	<i>r</i>	<i>pd</i>	<i>r</i>	<i>pd</i>	<i>r</i>	<i>pd</i>	<i>r</i>	<i>pd</i>	<i>r</i>	<i>pd</i>
AG1: Physical Aggression	0.14		0.05		<b>0.38</b>	+	<b>0.31</b>	+	0.30	+	-0.27	-	<b>0.41</b>	+	-0.13	-
AG2: Verbal Aggression	0.25		0.12		<b>0.33</b>	+	<b>0.33</b>	+	<b>0.36</b>	+	-0.12	-	<b>0.32</b>	+	-0.11	-
AG3: Anger	-0.02		<b>0.41</b>	+	0.28	+	<b>0.34</b>	+	0.12		-0.19	-	0.27	+	0.20	+
AG4: Hostility	-0.02		<b>0.39</b>	+	0.29	+	<b>0.32</b>	+	0.13		-0.25	-	<b>0.36</b>	+	0.21	+
AC1: Work Compulsion	0.01	+	0.05		-0.04		-0.05		-0.12		0.03		0.16		-0.03	
AC2: General Activity	0.23	+	-0.03		0.05		0.01		0.13		0.02		0.16		-0.16	
AC3: Restlessness	0.22	+	0.10		0.20		<b>0.31</b>	+	0.24	+	-0.01		0.20	+	-0.11	
AC4: Work Energy	0.04	+	-0.16		-0.19	-	-0.19		-0.17		0.14		-0.13		-0.22	
EX1: Positive Emotions	<b>0.42</b>	+	<b>-0.47</b>	-	-0.12		-0.05		0.15		0.23	+	0.00	+	<b>-0.45</b>	-
EX2: Social Warmth	<b>0.34</b>	+	-0.27	-	-0.19	-	-0.09		-0.05		<b>0.34</b>	+	-0.04	+	-0.29	-
EX3: Exhibitionism	<b>0.58</b>	+	-0.13	-	0.21	+	0.27	+	0.30	+	0.02		<b>0.44</b>	+	<b>-0.43</b>	-
EX4: Sociability	<b>0.59</b>	+	-0.25	-	-0.01		0.07		0.26	+	0.25	+	0.12	+	<b>-0.34</b>	-
NE1: Anxiety	-0.09	-	<b>0.60</b>	+	0.12		0.24	+	0.03		0.01		0.16	+	<b>0.39</b>	+
NE2: Depression	-0.26	-	<b>0.59</b>	+	0.08		0.10		-0.16	-	0.02		-0.01	+	<b>0.57</b>	+
NE3: Dependency	-0.19	-	<b>0.41</b>	+	-0.12		0.05		-0.18	-	0.09		0.11	+	<b>0.54</b>	+

NE4: Low Self-Esteem	-0.27	-	<b>0.55</b>	+	0.02	0.11	-0.13	0.01	-0.01	+	<b>0.65</b>	+				
SS1: Thrill/Adventure Seeking	<b>0.35</b>	+	-0.16		<b>0.32</b>	+	<b>0.35</b>	+	<b>0.75</b>	+	-0.08	<b>0.37</b>	+	-0.27	-	
SS2: Experience Seeking	<b>0.39</b>	+	-0.08		<b>0.32</b>	+	<b>0.34</b>	+	<b>0.61</b>	+	0.09	0.25	+	-0.19	-	
SS3: Disinhibition	<b>0.47</b>	+	-0.05		<b>0.35</b>	+	<b>0.42</b>	+	<b>0.62</b>	+	-0.01	<b>0.44</b>	+	-0.17	-	
SS4: Boredom /Impulsivity	0.22	+	0.12		<b>0.43</b>	+	<b>0.47</b>	+	<b>0.36</b>	+	-0.13	<b>0.30</b>	+	-0.12	-	
AG: Aggressiveness	0.11		0.28	+	<b>0.39</b>	+	<b>0.40</b>	+	0.29	+	-0.26	-	<b>0.42</b>	+	0.03	
AC: Activity	0.16	+	-0.02		-0.01		0.04		0.01		0.06		0.13		-0.17	
EX: Extraversion	<b>0.63</b>	+	<b>-0.36</b>	-	-0.03		0.07		0.21	+	<b>0.36</b>	+	0.17	+	<b>-0.49</b>	-
NE: Neuroticism	-0.25	-	<b>0.64</b>	+	0.03		0.12		-0.14	-	0.04		0.07	+	<b>0.65</b>	+
SS: Sensation Seeking	<b>0.45</b>	+	-0.07		<b>0.43</b>	+	<b>0.48</b>	+	<b>0.74</b>	+	-0.03	<b>0.42</b>	+	-0.24	-	

*Note:* Correlations > 0.30 are in boldface.

Table 2. Principal axis analysis with Varimax rotation including EPQ-RS scales, IVE scales, SPSR-20 and ZKA-PQ facets

	I	II	III	IV	V
Extraversion-EPQ	0.16	0.08	<b>0.61</b>	-0.22	0.37
Neuroticism-EPQ	0.21	0.06	-0.19	<b>0.67</b>	-0.02
Psychoticism-EPQ	0.35	0.01	-0.12	0.04	<b>0.44</b>
Impulsiveness-I <sub>7</sub>	0.35	0.06	0.04	0.17	<b>0.50</b>
Venturesomeness-I <sub>7</sub>	0.12	0.04	0.08	-0.14	<b>0.76</b>
Empathy- I <sub>7</sub>	-0.30	0.05	0.37	0.11	-0.04
SR. Sensitivity to Reward	<b>0.42</b>	0.10	0.14	0.05	0.37
SP. Sensitivity to Punishment	-0.10	-0.09	-0.26	<b>0.68</b>	-0.14
AG1: Physical Aggression	<b>0.64</b>	0.00	-0.17	-0.09	0.32
AG2: Verbal Aggression	<b>0.66</b>	0.09	0.12	-0.02	0.25
AG3: Anger	<b>0.72</b>	0.13	-0.13	0.34	0.07
AG4: Hostility	<b>0.70</b>	-0.04	-0.19	0.35	0.12
AC1: Work Compulsion	0.08	<b>0.62</b>	-0.01	0.03	-0.14
AC2: General Activity	0.00	<b>0.66</b>	0.11	-0.07	0.14
AC3: Restlessness	0.20	<b>0.56</b>	0.11	0.04	0.27
AC4: Work Energy	-0.13	<b>0.64</b>	0.15	-0.24	-0.30
EX1: Positive Emotions	-0.19	0.28	<b>0.56</b>	<b>-0.46</b>	0.07
EX2: Social Warmth	-0.22	0.03	<b>0.71</b>	-0.19	-0.15
EX3: Exhibitionism	0.35	0.07	<b>0.55</b>	-0.20	0.29
EX4: Sociability	-0.06	0.13	<b>0.71</b>	-0.19	0.26
NE1: Anxiety	0.19	0.21	-0.03	<b>0.73</b>	0.13
NE2: Depression	0.08	-0.10	-0.16	<b>0.80</b>	-0.03
NE3: Dependency	0.01	-0.07	0.10	<b>0.73</b>	-0.16
NE4: Low Self-Esteem	-0.03	-0.17	-0.17	<b>0.81</b>	0.01

SS1: Thrill/Adventure Seeking	0.14	0.11	0.01	-0.21	<b>0.79</b>
SS2: Experience Seeking	-0.02	-0.04	0.20	-0.05	<b>0.76</b>
SS3: Disinhibition	0.22	-0.05	0.21	-0.01	<b>0.78</b>
SS4: Boredom /Impulsivity	0.34	-0.17	-0.03	0.07	<b>0.55</b>
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<i>Initial Eigen</i>	2.42	1.38	2.13	6.04	5.71
%	8.64	4.93	7.60	21.56	20.37
<i>Post Rot. Eigen</i>	2.97	1.85	2.57	4.08	4.05
%	10.60	6.60	9.17	14.56	14.46
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*Note:* Loadings > 0.40 are in boldface.



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