# Short form of the Zuckerman–Kuhlman–Aluja Personality Questionnaire: Its trait and facet relationships with personality disorder functioning styles in Chinese general and clinical samples

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## ABSTRACT

Five-factor model of personality trait measures displays predictable associations with personality disorder features in both general and clinical populations. Facet-level measures such as the Zuckerman–Kuhlman–Aluja Personality Questionnaire offer more detailed associations in these aspects. Recently, a short form of this questionnaire (ZKA-PQ/SF), with five traits and four facets under each trait, has been developed for further application of personality measures in a reasonable short time. We hypothesized that ZKA-PQ/SF displays predictable associations with personality disorder functioning styles in both general and clinical populations. We therefore in China, invited 446 healthy volunteers and 112 personality disorder patients to undergo the tests of ZKA-PQ/SF, the Parker Personality Measure (PERM) and the Plutchik-van Praag Depression Inventory. Patients scored significantly higher on all PERM styles and on ZKA-PQ/SF Neuroticism and Aggressiveness traits and some of their facets, and lower on ZKA-PQ/SF Extraversion and its facets, and on Work Energy facet of Activity. ZKA-PQ/SF traits and some facets displayed associations with PERM styles supporting previous documentation, while those trait- and facet-related associations were even more specific in patients. Our results thus support the ZKA-PQ/SF application in clinical practice to aid the psychological explanation and the diagnosis of personality disorders, at least in Chinese culture.

## 1. Introduction

Empirical evidence suggests that personality traits can be measured dimensionally by a five-factor model, for instance through the Revised NEO Personality Inventory (NEO-PI-R, Costa and McCrae, 1995), with Openness to experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism; or by an alternative five-factor model, through the Zuckerman–Kuhlman Personality Questionnaire (ZKPQ, Zuckerman et al., 1993), with Impulsive Sensation Seeking, Neuroticism-Anxiety, Aggression-Hostility, Sociability, and Activity. In clinics, characterizations of personality disorder are in two ways. One way is the categorical assessment, which clearly defines disorders and creates a common language assisting clinicians' communication (Trull and Durrett, 2005), but has poor reliability (Clark et al., 1997) and inconsistent discriminant validity (McGlashan et al., 2005). The other is the dimensional one, which improves diagnostic reliability and validity of

personality disorders (Tyrer et al., 2015). For instance, the 290-item Dimensional Assessment of Personality Pathology has been applied to predict personality disorders (van den Broeck et al., 2014)

On the other hand, normal personality traits have demonstrated their power to aid the clinical diagnoses and assessments of personality disorders (Samuel and Widiger, 2008). For instance, both NEO-PI-R (Bagby et al., 2005) and ZKPQ (Huang et al., 2011) have demonstrated predictable relationships with the clinically defined personality disorders. Results have also shown that some differences on personality were confined to the variations of their related facets (Morizot and Le Blanc, 2003). Meanwhile, when predicting behaviors using the five-factor model, the narrow facets offered more detailed information than the broad traits did (Paunonen et al., 2003). However, facets sometimes failed to produce stronger effect sizes compared with trait-level analyses, or fail to increase discriminant features between personality disorders (Dyce and O'Connor, 1998), which might be due to that some

facets are ill-defined and arbitrary (Costa and McCrae, 2017); therefore, they might display non-precise relationship with more general trait factors (Allik et al., 2018). Nevertheless, trait facets under five-factor model have offered more specific and nuanced description of personality disorders (Samuel and Widiger, 2008).

After ZKPQ, Aluja et al. (2010) developed the Zuckerman–Kuhlman–Aluja Personality Questionnaire (ZKA-PQ) to measure both traits and facets. Both ZKA-PQ traits and facets predicted the Millon Clinical Multiaxial Inventory III 10 personality disorder scales (Aluja et al., 2012), for instance, Neuroticism predicted the paranoid, schizotypal, antisocial, borderline, narcissistic (–), avoidant, and dependent personality disorders; Aggressiveness the paranoid, antisocial, borderline, narcissistic, dependent (–), and obsessive-compulsive (–); Sensation Seeking the paranoid (–), antisocial, and obsessive-compulsive; Extraversion the schizoid (–), schizotypal (–), histrionic, narcissistic, and avoidant; and Activity the compulsive-obsessive. These results were consistent with a previous Chinese study showing that ZKPQ traits were associated with the 11 personality disorder functioning styles measured using the Parker Personality Measure (PERM, Parker and Hadzi-Pavlovic, 2001) in healthy volunteers and in personality disorder patients (Huang et al., 2011).

Afterwards, based on the 200-item long version of ZKA-PQ, Aluja et al. (2018) developed a short form (ZKA-PQ/SF), which comprised of five traits, with four facets under each trait. The convergent and discriminant validities of ZKA-PQ/SF have proven with regard to the Revised NEO Personality Inventory shortened form (Aluja et al., 2018). However, it has not been trialed in clinical population yet, especially in personality disorder patients. Considering that in Chinese context, both ZKPQ and the Five-Factor Nonverbal Personality Questionnaire have demonstrated predictable correlations between personality traits and personality disorder functioning styles (Huang et al., 2011; Gao et al., 2016), we have reasons to expect satisfactory relationships between ZKA-PQ/SF traits/ facets and the personality disorder functioning styles.

The purpose of the current study was to explore the potential predictability of the ZKA-PQ/SF traits and facets to the personality disorder functioning styles in healthy volunteers as well as in personality disorder patients. We have put forward two hypotheses based on previous results. Firstly, we believe that the five personality traits of ZKA-PQ/SF display their specific associations with personality disorder functioning styles in accordance with previous findings using ZKPQ. Secondly, we believe that ZKA-PQ/SF facets display more detailed relationships with the PERM styles, especially in patients with personality disorders. Therefore, we have invited both healthy volunteers and personality disorder patients to answer ZKA-PQ/SF and PERM in the current study. Moreover, since there is significant comorbidity between personality disorders and depression (Newton-Howes et al., 2006), we have recorded the depressive mood of our participants in the study.

## 2. Methods

### 2.1. Participants

Four hundred and forty six healthy volunteers (243 women and 203 men; mean age, 20.07 years with 1.79 S.D., age range, 18–27 years) from university students or community inhabitants mutually-introduced by students, and 112 patients with personality disorders (51 women and 61 men; mean age, 19.81 ± 1.71, age range, 18–26) were recruited from a psychological consultation center in a university campus, or outpatient clinic in university hospitals. The healthy volunteers did not suffer from any neurological or psychiatric disorders, and were free from alcohol, tobacco or substance abuse, as assessed through a semi-structured interview by an experienced psychiatrist (WW). The patients were diagnosed by the psychiatrist according to the criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, American Psychiatric Association, 2013): 1 patient with the

paranoid, 16 schizoid, 9 schizotypal, 11 antisocial, 13 histrionic, 3 narcissistic, 16 avoidant, 6 dependent, 13 obsessive-compulsive, and 16 passive-aggressive personality disorder, and 8 with multiple personality disorders. Patients suffered from no organic brain lesions according to recent magnetic resonance imaging or computed tomography scans, nor prior drug or alcohol abuse; they might present trends or mood episodes of depression, but were free from major depressive, bipolar, or anxiety disorder. No age ($t = -1.36$, $df = 556$, $p > 0.05$), gender ($\chi^2 = 2.88$, $df = 1$, $p > 0.05$) or education level ($\chi^2 = 2.85$, $df = 1$, $p > 0.05$) differences were found between the two groups. The study was approved by a local Ethics Committee, and all participants gave their written informed consents to participate.

### 2.2. Procedure

The healthy participants were tested collectively (in group) in a class- or a quiet-room, and patients were tested individually in a quiet room. All participants were welcomed by one PhD and one Master candidates (HF & CW, also co-authors of present study). These two students helped participants to fill out properly the informed consent, the required demographic information, and three questionnaires (see below), and to ensure corrective feedbacks. Participants were asked to fill out the questionnaires using a paper-and-pencil test module.

### 2.3. Instruments

A. The short form of the Zuckerman–Kuhlman–Aluja Personality Questionnaire (ZKA-PQ/SF; Aluja et al., 2018) has 80 items measuring 5 traits (factors), under each trait 4 facets, and under each facet 4 items (for names of the trait and facet, see Table 1). Each ZKA-PQ/SF item has a four-point Likert scale: 1 - disagree strongly, 2 - disagree somewhat, 3 - agree somewhat, and 4 - agree strongly. The internal alphas of each ZKA-PQ/SF trait and facet in the two groups of the current study are shown in Table 1.

B. The Parker Personality Measure (PERM; Parker and Hadzi-Pavlovic, 2001) measures 11 functioning styles of paranoid (10 items), schizoid (8 items), schizotypal (5 items), antisocial (10 items), borderline (10 items), histrionic (6 items), narcissistic (8 items), avoidant (10 items), dependent (10 items), obsessive-compulsive (6 items), and passive-aggressive (9 items) personality disorders. Each PERM item has a five-point Likert scale: 1 - very unlike me, 2 - moderately unlike me, 3 - somewhat like and unlike me, 4 - moderately like me, and 5 - very like me. The internal alphas of each PERM scale in the present study are also shown in Table 1.

C. The Plutchik-van Praag Depression Inventory (PVP; Plutchik and van Praag, 1987) contains 34 items. Each PVP item has a three-point scale (0, 1, 2), which corresponds to depressive tendencies. Participants have "possible depression" if they score between 20 and 25, or "depression" if they score higher than 25. The internal alphas of PVP were 0.80 in the healthy volunteers and 0.87 in personality disorder patients in the present study.

### 2.4. Statistical analyses

The Tucker congruence coefficients of the five ZKA-PQ/SF traits and the four facets under each trait, and the 11 PERM functioning styles between healthy participants and personality disorder patients were calculated based on the path coefficients using the Analysis of Moment Structures (AMOS) software (version 17.0, AMOS Development Corp., 2008, Crawfordville, FL). Mean scores of ZKA-PQ/SF and PERM scales in the two groups were compared by the independent Student $t$ test. Moreover, the respective values of Cohen's $d$ (effect sizes) were calculated for each group comparison. In order to look for different associations between personality disorder functioning styles and ZKA-PQ/SF traits or facets, we separately applied the Partial Correlation analysis first. Relationships between these parameters were later assessed by the

**Table 1**

Scale (factor) congruence coefficients, internal alphas and scores (Mean ± S.D.) of the short form of the Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ/SF) and the Parker Personality Measure (PERM) in the healthy controls and personality disorders.

| | Congruence Coefficient | Healthy controls (n = 446) | | Personality disorders (n = 112) | | 95% Confidence Interval |
|---|---|---|---|---|---|---|
| | | Alpha | Score | Alpha | Score | |
| **ZKA-PQ/SF** | | | | | | |
| Neuroticism (NE) | 0.99 | 0.83 | 36.04 ± 6.69 | 0.85 | 43.85 ± 8.17* | 6.16 – 9.45 |
| NE1 Anxiety | 0.99 | 0.63 | 8.28 ± 2.21 | 0.70 | 10.49 ± 2.68* | 1.67 – 2.75 |
| NE2 Depression | 0.96 | 0.56 | 10.10 ± 2.03 | 0.66 | 11.88 ± 2.45* | 1.28 – 2.27 |
| NE3 Dependence | 0.99 | 0.60 | 9.92 ± 2.22 | 0.66 | 11.71 ± 2.73* | 1.24 – 2.34 |
| NE4 Low Self-esteem | 0.99 | 0.69 | 7.75 ± 2.13 | 0.73 | 9.78 ± 2.84* | 1.46 – 2.60 |
| Aggressiveness (AG) | 0.96 | 0.81 | 32.61 ± 6.64 | 0.84 | 38.88 ± 8.57* | 4.55 – 8.00 |
| AG1 Physical Aggression | 0.99 | 0.81 | 7.10 ± 2.72 | 0.82 | 8.38 ± 3.28* | 0.62 – 1.95 |
| AG2 Verbal Aggression | 0.97 | 0.57 | 9.07 ± 2.30 | 0.67 | 10.29 ± 2.86* | 0.64 – 1.79 |
| AG3 Anger | 0.96 | 0.44 | 9.50 ± 1.97 | 0.60 | 11.01 ± 2.52* | 1.00 – 2.01 |
| AG4 Hostility | 0.99 | 0.60 | 6.94 ± 1.93 | 0.61 | 9.21 ± 2.65* | 1.74 – 2.79 |
| Sensation Seeking (SS) | 0.94 | 0.76 | 36.76 ± 6.46 | 0.75 | 37.26 ± 7.22 | −0.87 – 1.88 |
| SS1 Thrill and Adventure Seeking | 0.99 | 0.63 | 7.94 ± 2.52 | 0.62 | 8.09 ± 2.77 | −0.39 – 0.68 |
| SS2 Experience Seeking | 0.98 | 0.60 | 10.34 ± 2.43 | 0.66 | 9.94 ± 2.94 | −0.93 – 0.13 |
| SS3 Disinhibition | 0.99 | 0.62 | 9.16 ± 2.33 | 0.58 | 9.93 ± 2.60* | 0.28 – 1.26 |
| SS4 Boredom Susceptibility/Impulsivity | 0.97 | 0.06 | 9.32 ± 1.66 | 0.19 | 9.30 ± 2.02 | −0.42 – 0.40 |
| Extraversion (EX) | 0.98 | 0.86 | 45.80 ± 7.28 | 0.88 | 41.05 ± 9.11* | −6.58 – −2.92 |
| EX1 Positive Emotions | 0.93 | 0.73 | 11.89 ± 2.19 | 0.73 | 10.46 ± 2.63* | −1.97 – −0.90 |
| EX2 Social Warmth | 0.99 | 0.72 | 11.16 ± 2.50 | 0.74 | 9.40 ± 3.11* | −2.39 – −1.13 |
| EX3 Exhibitionism | 0.99 | 0.81 | 11.32 ± 2.54 | 0.84 | 10.94 ± 3.01 | −0.99 – 0.23 |
| EX4 Sociability | 0.99 | 0.60 | 11.43 ± 2.12 | 0.73 | 10.26 ± 2.75* | −1.73 – −0.63 |
| Activity (AC) | 0.97 | 0.82 | 39.33 ± 6.60 | 0.82 | 38.22 ± 7.69 | −2.52 – 0.32 |
| AC1 Work Compulsion | 0.99 | 0.62 | 9.23 ± 2.25 | 0.66 | 8.82 ± 2.64 | −0.94 – 0.13 |
| AC2 General Activity | 0.98 | 0.62 | 9.58 ± 2.23 | 0.53 | 9.21 ± 2.46 | −0.85 – 0.10 |
| AC3 Restlessness | 0.99 | 0.63 | 8.52 ± 2.18 | 0.66 | 8.89 ± 2.69 | −0.16 – 0.92 |
| AC4 Work Energy | 0.99 | 0.77 | 12.00 ± 2.18 | 0.73 | 11.30 ± 2.58* | −1.22 – −0.18 |
| **PERM** | | | | | | |
| Paranoid | 0.96 | 0.79 | 19.00 ± 5.26 | 0.74 | 28.79 ± 6.66* | 8.46 – 11.13 |
| Schizoid | 0.47 | 0.21 | 18.44 ± 3.02 | 0.54 | 22.19 ± 4.95* | 2.78 – 4.71 |
| Schizotypal | 0.98 | 0.67 | 8.76 ± 2.81 | 0.69 | 13.95 ± 4.33* | 4.34 – 6.04 |
| Antisocial | 0.94 | 0.66 | 18.22 ± 4.34 | 0.76 | 25.73 ± 6.73* | 6.19 – 8.84 |
| Borderline | 0.97 | 0.73 | 18.30 ± 4.70 | 0.77 | 27.28 ± 7.25* | 7.55 – 10.40 |
| Histrionic | 0.95 | 0.55 | 11.89 ± 2.96 | 0.57 | 16.96 ± 4.03* | 4.26 – 5.87 |
| Narcissistic | 0.94 | 0.71 | 16.00 ± 4.19 | 0.64 | 22.16 ± 5.11* | 5.13 – 7.19 |
| Avoidant | 0.99 | 0.78 | 23.69 ± 6.00 | 0.83 | 33.24 ± 7.68* | 8.02 – 11.09 |
| Dependent | 0.98 | 0.68 | 20.83 ± 4.88 | 0.77 | 27.95 ± 6.96* | 5.74 – 8.50 |
| Obsessive-Compulsive | 0.84 | 0.51 | 15.91 ± 3.50 | 0.72 | 18.64 ± 4.76* | 1.79 – 3.69 |
| Passive-Aggressive | 0.66 | 0.65 | 19.39 ± 4.64 | 0.71 | 26.29 ± 6.18* | 5.67 – 8.13 |

* $p < 0.05$ vs. Healthy controls; effect sizes are given in text.

multiple linear regression analyses (stepwise method) to the relationships between the 11 PERM styles and the five ZKA-PQ/SF traits, and between the 11 PERM styles and the 20 facets, taking ZKA-PQ/SF traits or facets as potential predictors for the PERM styles. A $p$ value less than 0.05 was considered to be significant. In order to avoid the chances of Type I error, based on the sample sizes of our current design and on our previous results, we set the significant level of correlation (PVP with ZKA-PQ/SF or PERM) at the absolute $r$ value higher than 0.25 ($p < 0.05$), and of prediction (PERM by ZKA-PQ/SF) at the absolute beta higher than 0.30 ($p < 0.05$).

## 3. Results

The Tucker congruence coefficients of ZKA-PQ/SF and PERM scales between two group samples were all above 0.93, except those of PERM Schizoid (0.47), Obsessive-Compulsive (0.84), and Passive-Aggressive (0.66) scales. In both groups, internal alphas of these scales were satisfactory, except those of Boredom Susceptibility/ Impulsivity facet in healthy controls (internal alpha = 0.06) and in personality disorders (0.19), and of Schizoid (0.21) style in healthy controls. The item "Before I get into a new situation, I like to find out what to expect from it." of the Boredom Susceptibility/ Impulsivity facet performed the worst among the four (The internal alpha if deleted of this item = 0.34) (Table 1).

All participants scored less than 25 on PVP, however, the mean PVP score in personality disorders (16.96 ± 4.45) was higher than that in

controls (15.51 ± 4.37, $df = 556$, $p < 0.01$, 95% Confidence Interval (CI): 0.53 – 2.38, Cohen's $d = 0.33$). Personality disorders scored significantly higher than the controls did on the ZKA-PQ/SF Neuroticism ($p < 0.001$) and Aggressiveness ($p < 0.001$) traits, and significantly lower on the Extraversion ($p < 0.001$) traits. Personality disorders also scored significantly higher on the Anxiety, Depression, Dependence, Low Self-esteem, Physical Aggression, Verbal Aggression, Anger, Hostility, and Disinhibition facets ($p < 0.01$), and significantly lower on the Positive Emotions, Social Warmth, Sociability, and Work Energy ($p < 0.01$) facets. In addition, personality disorders scored significantly higher on the Paranoid, Schizoid, Schizotypal, Antisocial, Borderline, Histrionic, Narcissistic, Avoidant, Dependent, Obsessive-Compulsive, and Passive-Aggressive (all $ps < 0.05$) styles (Table 1).

In controls, PVP was significantly correlated with ZKA-PQ/SF Sensation Seeking ($r = 0.29$, $p < 0.001$) and Activity ($r = 0.28$, $p < 0.001$) traits, with Thrill and Adventure Seeking (SS1, $r = 0.28$, $p < 0.001$), Disinhibition (SS3, $r = 0.27$, $p < 0.001$), and Exhibitionism (EX3, $r = 0.26$, $p < 0.001$) facets, and with PERM Avoidant ($r = 0.28$, $p < 0.001$) functioning style. In clinical sample, PVP was significantly correlated with Sensation Seeking ($r = 0.36$, $p < 0.001$) trait, with Experience (SS2, $r = 0.26$, $p < 0.01$), Disinhibition (SS3, $r = 0.28$, $p < 0.01$), Boredom Susceptibility/ Impulsivity (SS4, $r = 0.32$, $p < 0.01$), Exhibitionism (EX3, $r = 0.28$, $p < 0.01$), and Restlessness (AC3, $r = 0.27$, $p < 0.01$) facets, and with Histrionic ($r = 0.36$, $p < 0.001$) and Narcissistic ($r = 0.26$, $p < 0.01$) styles.

After controlling PVP, all traits/ facets of ZKA-PQ/SF were

**Table 2**

Relationships ($rs$) between the short form of the Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ/SF) traits and facets, and the Parker Personality Measure (PERM) in the healthy controls (Healthy, $n = 446$) and personality disorders (Patients, $n = 112$) after controlling depression.

| | Paranoid Healthy | Patients | Schizoid Healthy | Patients | Schizotypal Healthy | Patients | Antisocial Healthy | Patients | Borderline Healthy | Patients | Histrionic Healthy | Patients |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ZKA-PQ/SF** | | | | | | | | | | | | |
| Neuroticism (NE) | 0.46 | 0.35 | | | 0.45 | 0.31 | 0.28 | | 0.66 | 0.56 | 0.43 | |
| NE1 Anxiety | 0.45 | 0.46 | | | 0.44 | 0.28 | 0.30 | | 0.61 | 0.55 | 0.41 | |
| NE2 Depression | 0.31 | | | | 0.32 | | | | 0.48 | 0.42 | 0.34 | |
| NE3 Dependence | 0.34 | | | −0.36 | 0.26 | | | | 0.46 | 0.26 | 0.31 | 0.27 |
| NE4 Low Self-esteem | 0.33 | | | | 0.38 | 0.38 | | | 0.49 | 0.49 | 0.28 | |
| Aggressiveness (AG) | 0.52 | 0.48 | −0.45 | | | | 0.41 | 0.31 | 0.42 | 0.37 | 0.49 | 0.42 |
| AG1 Physical Aggression | 0.36 | 0.33 | | | | | 0.38 | 0.33 | 0.25 | 0.30 | 0.30 | |
| AG2 Verbal Aggression | 0.28 | | −0.42 | | | | | | | | 0.26 | 0.30 |
| AG3 Anger | 0.38 | 0.37 | −0.51 | | | | 0.25 | | 0.38 | 0.37 | 0.44 | 0.41 |
| AG4 Hostility | 0.56 | 0.56 | −0.35 | | 0.32 | | 0.42 | 0.37 | 0.47 | 0.30 | 0.48 | 0.39 |
| Sensation Seeking (SS) | | | | | | | 0.29 | | | | | |
| SS1 Thrill and Adventure Seeking | | | | | | | | | | | | |
| SS2 Experience Seeking | | | | | | | | | | | | |
| SS3 Disinhibition | | | | | | | 0.31 | 0.27 | | | 0.26 | |
| SS4 Boredom Susceptibility/ Impulsivity | | | | | | | | | | | | |
| Extraversion (EX) | | | −0.34 | −0.51 | −0.30 | −0.50 | | | −0.29 | −0.26 | | |
| EX1 Positive Emotions | | −0.28 | | | | −0.39 | | | −0.30 | −0.42 | | |
| EX2 Social Warmth | | | −0.39 | −0.42 | −0.33 | −0.35 | | 0.29 | −0.28 | | | |
| EX3 Exhibitionism | | | | −0.46 | | −0.30 | | | | | | |
| EX4 Sociability | | | −0.35 | −0.49 | −0.31 | −0.54 | | | | | | |
| Activity (AC) | | | | −0.40 | | −0.27 | | | | | | |
| AC1 Work Compulsion | | | | | | −0.31 | | | | | | |
| AC2 General Activity | | | | −0.31 | | | | | | | | |
| AC3 Restlessness | 0.25 | | | −0.40 | | | 0.36 | | 0.28 | | 0.34 | |
| AC4 Work Energy | | | | −0.34 | | | −0.29 | | | | | |

| | Narcissistic Healthy | Patients | Avoidant Healthy | Patients | Dependent Healthy | Patients | Obsessive-Compulsive Healthy | Patients | Passive-Aggressive Healthy | Patients |
|---|---|---|---|---|---|---|---|---|---|---|
| **ZKA-PQ/SF** | | | | | | | | | | |
| Neuroticism (NE) | 0.30 | | 0.63 | 0.64 | 0.54 | 0.49 | | | 0.25 | |
| NE1 Anxiety | 0.29 | | 0.48 | 0.55 | 0.41 | 0.39 | | | | |
| NE2 Depression | | | 0.42 | 0.37 | 0.35 | 0.32 | | | | |
| NE3 Dependence | 0.29 | | 0.48 | 0.39 | 0.49 | 0.43 | 0.25 | | | |
| NE4 Low Self-esteem | | | 0.57 | 0.63 | 0.45 | 0.37 | | | | |
| Aggressiveness (AG) | 0.38 | 0.47 | | | | | | | 0.46 | 0.43 |
| AG1 Physical Aggression | 0.28 | | | | | | | | 0.37 | 0.44 |
| AG2 Verbal Aggression | | 0.33 | | | | | | | 0.30 | |
| AG3 Anger | 0.27 | 0.38 | 0.27 | | | | | | 0.29 | 0.29 |
| AG4 Hostility | 0.43 | 0.53 | 0.31 | | | | | | 0.39 | 0.40 |
| Sensation Seeking (SS) | | | | −0.25 | | | | | | |
| SS1 Thrill and Adventure Seeking | | | | | | | | | | |
| SS2 Experience Seeking | | | | | | | | | | |
| SS3 Disinhibition | | | | | | | | | | |
| SS4 Boredom Susceptibility/Impulsivity | | | | −0.29 | | | | | | |
| Extraversion (EX) | | | −0.43 | −0.61 | | | | | | |
| EX1 Positive Emotions | | | −0.32 | −0.52 | −0.26 | | | | | |
| EX2 Social Warmth | | | −0.43 | −0.57 | | | | | | |
| EX3 Exhibitionism | | | | −0.38 | | | | | | |
| EX4 Sociability | | | −0.36 | −0.46 | | | | | | |
| Activity (AC) | | | | | | | 0.36 | 0.39 | | |
| AC1 Work Compulsion | | | | | | | 0.31 | 0.26 | | |
| AC2 General Activity | | | | | | | 0.32 | 0.34 | | |
| AC3 Restlessness | | 0.37 | | | | | | | | |
| AC4 Work Energy | | | | | | | 0.33 | 0.41 | | −0.30 |

Note: Absolute $rs \geq 0.25$ are presented, and all correlations are at $p < 0.01$.

significantly correlated with one or more specific PERM styles in both groups, except Experience Seeking. For instance, Neuroticism trait was significantly correlated (all $rs \geq 0.25$, $ps < 0.01$) with Paranoid, Schizotypal, Borderline, Avoidant, and Dependent styles across groups; Aggressiveness with Paranoid, Antisocial, Borderline, Histrionic, Narcissistic, and Passive-Aggressive; and Extraversion with Schizoid, Schizotypal, Borderline, Avoidant (–); Activity, and Obsessive-Compulsive. Consistently, ZKA-PQ/SF facets were more specifically correlated with PERM styles than traits were. For example, Disinhibition facet was significantly correlated with Antisocial style rather than the other three facets under the same Sensation Seeking

trait (Table 2).

Considering the prediction of PERM functioning styles by the ZKA-PQ/SF traits, the accounted variances (adjusted $R^2$ values) were ranged from 0.13 to 0.49 (average $R^2 = 0.29$) in healthy volunteers, and from 0.18 to 0.59 (average $R^2 = 0.28$) in patients; as for facets, the accounted variances were ranged from 0.20 to 0.53 (average $R^2 = 0.34$) in healthy volunteers, and from 0.19 to 0.61 (average $R^2 = 0.38$) in patients. All accounted variances of ZKA-PQ/SF facet predictions were higher than those of trait predictions in two groups except that of the Histrionic style in patients (the adjusted $R^2$ values were 0.19 at both trait and facet levels). For traits in the personality disorder group, most

**Table 3**

Stepwise multiple regressions predicting the Parker Personality Measure styles with the short form of the Zuckerman-Kuhlman-Aluja Personality Questionnaire traits and facets (which were analyzed separately, see text) in the healthy controls and the personality disorders.

| | Healthy controls (n = 446) | | | | | | Personality disorders (n = 112) | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Adjusted $R^2$ | β | Trait predictors | Adjusted $R^2$ | β | Facet predictors | Adjusted $R^2$ | β | Trait predictors | Adjusted $R^2$ | β | Facet predictors |
| Paranoid | 0.35 | 0.40<br>0.32 | Aggressiveness**<br>Neuroticism** | 0.42 | 0.32 | Hostility (AG4)** | 0.26 | 0.50 | Aggressiveness** | 0.42 | 0.48<br>0.43 | Hostility (AG4)**<br>Anxiety (NE1)** |
| Schizoid | 0.13 | −0.38 | Extraversion** | 0.20 | | | 0.44 | −0.55<br>−0.32 | Extraversion**<br>Aggressiveness** | 0.52 | −0.44 | Anger (AG3)** |
| Schizotypal | 0.24 | 0.39 | Neuroticism** | 0.29 | | | 0.28 | −0.51 | Extraversion** | 0.39 | −0.60 | Sociability (EX4)** |
| Antisocial | 0.23 | 0.31 | Aggressiveness** | 0.34 | | | 0.18 | 0.33<br>0.31<br>−0.30 | Aggressiveness**<br>Sensation Seeking**<br>Activity** | 0.33 | −0.31 | Work Energy (AC4)** |
| Borderline | 0.49 | 0.55 | Neuroticism** | 0.53 | 0.30 | Anxiety (NE1)** | 0.32 | 0.47 | Neuroticism** | 0.47 | −0.30<br>0.30 | Positive Emotions (EX1)**<br>Restlessness (AC3)** |
| Histrionic | 0.34 | 0.34<br>0.31 | Aggressiveness**<br>Neuroticism** | 0.36 | | | 0.19 | 0.39 | Aggressiveness** | 0.19 | 0.39 | Anger (AG3)** |
| Narcissistic | 0.19 | | | 0.27 | | | 0.21 | 0.46 | Aggressiveness** | 0.37 | 0.38 | Hostility (AG4)** |
| Avoidant | 0.46 | 0.58 | Neuroticism** | 0.48 | | | 0.59 | 0.48<br>−0.48 | Neuroticism**<br>Extraversion** | 0.61 | 0.35<br>−0.35 | Low Self-esteem (NE4)**<br>Social Warmth (EX2)** |
| Dependent | 0.31 | 0.56 | Neuroticism** | 0.34 | 0.34 | Dependence (NE3)** | 0.24 | 0.49 | Neuroticism** | 0.29 | 0.41 | Dependence (NE3)** |
| Obsessive-Compulsive | 0.18 | 0.42 | Activity** | 0.21 | | | 0.24 | 0.61 | Activity** | 0.26 | 0.36 | Work Energy (AC4)** |
| Passive-Aggressive | 0.22 | 0.42 | Aggressiveness** | 0.25 | | | 0.18 | 0.43 | Aggressiveness** | 0.31 | 0.35<br>−0.30 | Physical Aggression (AG1)**<br>Work Energy (AC4)** |

*Note:* * $p$ < 0.05,

** $p$ < 0.01; absolute βs ≥ 0.30 are presented. For other abbreviations, see Table 1.

predictors of a given personality disorder functioning style were prominent ($\beta$s > 0.30): Neuroticism predicted the Borderline, Avoidant, and Dependent styles; Aggressiveness the Paranoid, Schizoid (–), Antisocial, Histrionic, Narcissistic, and Passive-Aggressive styles; Sensation Seeking the Antisocial; Extraversion the Schizoid (–), Schizotypal (–), and Avoidant (–) styles; Activity the Antisocial (–) and Obsessive-Compulsive styles. For traits in the control group, Neuroticism (the $\beta$s > 0.30) was the most prominent predictor of all 11 personality disorder styles, and then the Aggressiveness ($\beta$s > 0.30). For instance, Neuroticism predicted the Paranoid ($\beta$ = 0.40), Schizotypal (0.39), Borderline (0.55), Histrionic (0.31), Avoidant (0.58), and Dependent (0.56) styles; Aggressiveness predicted the Paranoid (0.40), Antisocial (0.31), Histrionic (0.34), and Passive-Aggressive (0.42) styles. For facets in controls, Anxiety predicted the Borderline (0.30), Dependence the Dependent (0.34), and Hostility the Paranoid (0.32) style (Table 3).

## 4. Discussion

In the current study, patients scored significantly higher than the healthy volunteers did on the ZKA-PQ/SF Neuroticism and Aggressiveness traits and on all 11 PERM functioning styles, while lower on ZKA-PQ/SF Extraversion. In patients, all five ZKA-PQ/SF traits and the facets of four ZKA-PQ/SF traits were associated with one or more personality disorder functioning styles, which confirmed our first hypothesis. At facet level, patients scored higher than healthy volunteers on Disinhibition (Sensation Seeking) and all facets of Neuroticism and Aggressiveness, while lower on Positive Emotions, Social Warmth, Sociability (Extraversion) and Work Energy (Activity). In both control and personality disorder groups, the accounted variances of ZKA-PQ/SF facets were higher than traits when predicting PERM styles, except that for predicting Histrionic in the personality disorder group, where the adjusted $R^2$ values were similar. Facets offered more information and more-specific information than traits did, especially in patients. For instance, in two groups, Aggressiveness and its facet Hostility predicted Paranoid, likewise Neuroticism and its facet Dependence predicted Dependent, with higher adjusted $R^2$ values for the facets. Meanwhile, when predicting Schizotypal in patients, the absolute beta value of Sociability facet was even higher than that of Extraversion. Hence out our second hypothesis was confirmed.

Our patients scored significantly higher on PVP as reported previously (Morey et al., 2010). The PVP was correlated with Histrionic and Narcissistic styles in our patients, also in line with previous reports (Ronningstam, 2010; Skodol et al., 2011). In controls, PVP was correlated with Sensation Seeking and Activity traits, which agreed with the notion that the personality traits (and facets) predicted depressive symptoms, hopelessness, and suicide ideation (Chioqueta and Stiles, 2005). In controls, PVP was also correlated with Avoidant, in accordance with the high comorbidity between the depressive disorder and personality disorder (Friborg et al., 2014).

In the current study, correlations between ZKA-PQ/SF facets and PERM styles were stronger and clearer than those between related traits and styles. Thus, our results have extended the relationship understanding between personality disorder and traits measured with the long version ZKA-PQ (Aluja et al., 2012), through adding the facet performance. Our study has indicated that the Anger and Hostility facets were correlated with Borderline style, Anger facet with Narcissistic style, and Work Compulsion and General Activity facets with Obsessive-Compulsive style, which overtook the ZKA-PQ trait performance in clinics (Aluja et al., 2012). These results were in accordance with that the borderline personality disorder was characterized by the enduring patterns of anger and hostility (Gardner et al., 1991), the narcissistic personality disorder by the increased arousability of anger (McCann and Biaggio, 1989), and the obsessive-compulsive personality disorder by prominent workaholism (Mudrack, 2004).

Regarding predictions, the Aggressiveness trait was a consistent

predictor for Paranoid, Antisocial, Histrionic, and Passive-Aggressive of PERM styles in the two groups, and for Schizoid (–) and Narcissistic in the patient group; the Hostility facet predicted Paranoid in both groups, and predicted Narcissistic in the patient group, the Anger facet predicted Schizoid (–) and Histrionic, and the Physical Aggression facet predicted Passive-Aggressive in the patient group, which were again consistent with the previous reports. Aggressiveness is similar to ZKPQ Aggression-Hostility (Zuckerman, 2002, 2008), which predicted the paranoid, antisocial, histrionic, narcissistic, and passive-aggressive in general population and in personality disorder patients (Aluja et al., 2007a,b; Huang et al., 2011). Moreover, paranoid, schizoid (–), histrionic and narcissistic personality disorders were comparable to the Hostility facet of NEO-PI-R Neuroticism (Reynolds and Clark, 2001).

The Neuroticism trait was associated with the Borderline, Avoidant, and Dependent styles in two groups, and with the Paranoid, Schizotypal, and Histrionic in healthy controls; its facet Dependence was associated with Dependent in two groups, and its facet Anxiety with Paranoid in the patient group and with Borderline in the control group. All these outcomes are in concert with former studies using NEO-PI-R (Trull et al., 1995), ZKPQ (Aluja et al., 2007a,b) or ZKA-PQ (Aluja et al., 2012). In addition, Clarkin et al. (1993) found that the Identity/ Interpersonal and Impulsivity, two of the three core features of borderline personality disorder, were correlated with Neuroticism. Moreover, Costa and McCrae (1990) reported a clear association between Neuroticism and avoidant and dependent personality disorders. ZKA-PQ/SF Neuroticism consists of negative moods such as anxiety and depression, which referred to the insufficiency of the positive psychological-adjustment and the emotional stability (Costa and McCrae, 1988; Judge et al., 1999).

The Extraversion trait was associated with the Schizoid style (–) in both groups, which was supported by previous results (Widiger and Trull, 1992). In the patient group, Extraversion trait was negatively predicted Schizotypal and Avoidant styles, but one facet of it Positive Emotions was negatively associated with Borderline, another facet Social Warmth was negatively with Avoidant, and its third facet Sociability negatively with Schizotypal. These findings were generally in line with previous results stating that personality disorders were characterized by shyness and reclusive qualities such as schizoid, schizotypal, and avoidant personality disorders (Widiger et al., 2002; Aluja et al., 2007c), and that the borderline personality disorder had the likewise disturbances in the processing and regulation of emotions (Tragesser et al., 2007; Schulze et al., 2016).

In addition, Activity trait was associated with Antisocial (–) in the patient group, and with Obsessive-Compulsive in both groups. In the patient group, its facet Work Energy predicted Antisocial (–), Obsessive-Compulsive, and Passive-Aggressive (–), and Restlessness were associated with Borderline. These results were supported by previous studies showing that Activity was correlated with the obsessive-compulsive personality disorder (Aluja et al., 2012). Our results also confirmed that the passive resistance to adequate social and occupational performance was one of the primary diagnostic criteria for passive-aggressive personality disorder (Furnham and Crump, 2005), and the affective instability was for borderline personality disorder (Trull et al., 2008). Moreover, our results were in line with that the Activity was moderate-negatively associated with the antisocial style in personality disorder patients in a previous study (Huang et al., 2011). Further, our finding of Sensation Seeking in association with Antisocial in the patient group was in accordance with the previous results (Huang et al., 2011).

Overall, ZKA-PQ/SF Aggressiveness trait was associated with PERM Histrionic style, Hostility facet with Paranoid, and Anxiety with Borderline, suggesting that the short version is more sensitive and effective than the long version (Aluja et al., 2012). Further, compared with the findings of ZKPQ correlates of personality disorder functioning styles in Chinese population (Huang et al., 2011), the current results displayed clearer and more robust associations, for instance, those between ZKA-PQ/SF Aggressiveness trait and PERM Histrionic and

Passive-Aggressive styles, and those (negative ones) between Extraversion and Schizoid, Schizotypal, and Avoidant.

Finally, there are at least three limitations of the current study which should be recognized. First, the sample sizes of each individual type of personality disorder were non-equally distributed, thus call for further clinical testing in larger samples. Second, the internal reliabilities of PERM Schizoid style and the ZKA-PQ/SF Boredom Susceptibility/ Impulsivity facet were relatively lower, and the congruence coefficient of Schizoid was again relatively lower, which might call some modifications of them. Third, our participants were young adults, which brought about that results obtained in this age group might not be generalized to a broader age population. However, we found associations between ZKA-PQ/SF traits or facets and PERM styles in the general and personality disorder samples, and facets partially demonstrated more specific associations than the traits did, suggesting an applicability of the ZKA-PQ/SF in clinics within China as well as worldwide.

## Declarations of interest

None.

## Ethical approval

The study was approved by a local Ethics Committee, and all participants gave their written informed consents to participate. Regarding research work described in the paper, each one of our co-authors, Hongying Fan, Chu Wang, Xu Shao, Yanli Jia, Anton Aluja, and Wei Wang, has conformed to the Helsinki Declaration concerning human rights and informed consent, and has followed correct procedures concerning treatment of humans in research.

## Authors' contribution

WW and AA conceived the study, HF, CW, XS, and YJ collected the data, HF, CW, AA and WW analyzed the data, HF, AA and WW drafted the paper.

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