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Psychometric Properties of the Chinese Shortened Version of the Zuckerman–Kuhlman Personality Questionnaire in a Sample of Adolescents and Young Adults

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Introduction: The original 89-item Zuckerman–Kuhlman Personality Questionnaire (form III Revised, ZKPQ-III-R) is a widely accepted and used self-report measure for personality traits. This study assessed the reliability and construct validity of the Chinese short 46-item version of the ZKPQ-III-R in a sample of adolescents and young adults.

Methodology: A total of 1,019 Chinese adolescents and young adults completed the Chinese version of the original 89-item version ZKPQ-III-R and short 46-item version ZKPQ-III-R, self-report measures of depression, life satisfaction, and subjective health complaints (SHC), the Big Five personality traits, and a substance use risk profile. We explored the internal consistency of five dimensions of the short 46-item version ZKPQ-III-R and compared it with observations in previous studies of Chinese and other populations. The structure of the questionnaire was analyzed by confirmatory factor analysis and exploratory structural equation modeling.

Results: The short 46-item version ZKPQ-III-R had adequate internal reliability for all five dimensions, with Cronbach's α coefficients of 0.63 to 0.84. The concurrent validity of the short 46-item version ZKPQ-III-R was supported by significant correlations with depression, life satisfaction, and SHC. The short 46-item version ZKPQ-III-R had better fit, similar reliability coefficients, and slightly better construct and convergent validity than the 89-item version.

Conclusion: The Chinese version of the 46-item ZKPQ-III-R presented reliability and validity in measuring personality in Chinese adolescents and young adults.

Keywords: ZKPQ-III-R, reliability, validity, confirmatory factor analysis, adolescents

INTRODUCTION

The Zuckerman–Kuhlman Personality Questionnaire (form III Revised [ZKPQ-III-R]) was developed to assess the five basic dimensions of the Alternative Five-Factor Model (AFFM) that was proposed by Zuckerman et al. (1993). The AFFM is considered a revised model of the "Big Five," which consists of five domains of personality. The original version ZKPQ-III-R consisted of

89 items measuring five dimensions: Impulsive Sensation Seeking (ImpSS), Neuroticism-Anxiety (N-Anx), Aggression-Hostility (Agg-Host), Activity (Act), and Sociability (Sy) (Rahim et al., 2013). ImpSS items involve a lack of planning and tendency to act impulsively without thinking, experience seeking, or the willingness to take risks for the sake of excitement or novel experiences. N-Anx items refer to emotional upset, worry, fearfulness, tension, obsessive indecision, a lack of self-confidence, and sensitivity to criticism. Agg-Host items describe a readiness to express verbal aggression, rudeness, thoughtless or antisocial behavior, vengefulness, and spitefulness and refer to having a quick temper and impatience with others. Act items describe the need for Act and an inability to relax and do nothing when the opportunity presents itself or a preference for challenging work, an active lifestyle, and a high level of energy. Sy items describe the number of friends one has and outgoingness at parties and a preference for being with others as opposed to being alone.

The ZKPQ-III-R has exhibited equivalent factor structure and reliability in several di□erent language versions, and the psychometric properties generally indicated that these translations are valid and reliable (Ostendorf and Angleitner, 1994; Wu et al., 2000; Herrero, 2001; De Pascalis and Russo, 2003; Rossier et al., 2008). For the Chinese version of the ZKPQ-III-R, Wu et al. (2000) reported that internal consistency reliability (Cronbach's α) ranged from 0.61 to 0.81 in general Chinese samples. Principal component analysis detected 16 factors with eigenvalues greater than 1.5, and the first five of 16 factors accounted for 21.0% of the variance. Wang et al. (2002) reported that internal consistency reliability (Cronbach's α) ranged from 0.52 to 0.81 in Chinese college students without siblings. In another study, Wang et al. (2004) reported Cronbach's α coe□cients from 0.60 to 0.81. Chai et al. (2013) reported internal consistency reliability from 0.61 to 0.81 in Chinese middle school students. The ZKPQ-III-R has also been validated as a powerful tool for personality assessment in adolescents (Aluja et al., 2002).

To our knowledge, four short versions of the ZKPQ-III-R have been developed. Zuckerman (2002) developed a 35-item short form (ZKPQ-S) with seven items per subscale. Several items were excluded because of high correlation with other selected items (Zuckerman, 2002). These short scales had Cronbach's α coe□cients between 0.62 and 0.79. Aluja et al. (2003) proposed a 69-item short version of the ZKPQ based on exploratory and confirmatory factor analysis (CFA). Internal consistency was similar to the 89-item version, varying between 0.71 and 0.81. Aluja et al. (2006) proposed a third shortened form, the ZKPQ-50-CC, which consisted of 50 items that were selected

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each dimensions of the ZKPQ-III-R. The analysis also included factor analysis with promax rotation and calculations of Pearson correlation coefficients between the subscale scores. The factor analysis was computed separately for the ZKPQ five-factor model together with eigenvalues ≥ 1. Items were deleted based on the following criteria: (a) items in each pair with lower loadings (i.e., loading ≤ 0.30 on the remaining factors), (b) items that correlated with more than one item, and (c) items with modification indices (MIs) ≥ 50 after CFA.

We used the following indices to assess the model fit: χ^2/df, root mean square error of approximation (RMSEA), confidence interval (CI), weighted root mean square residual (WRMR), comparative fit index (CFI), and Tucker-Lewis index (TLI). According to generally accepted criteria, a good fit would be indicated by CFI > 0.95 and TLI > 0.95, and an acceptable fit would be indicated by CFI > 0.90 and TLI > 0.90. RMSEA values ≤ 0.05 would be considered good. RMSEA values between 0.05 and 0.08 would be considered adequate, and RMSEA values between 0.08 and 0.10 would be considered mediocre. Values of $p < 0.05$ were considered statistically significant (Schermelleh-Engel et al., 2003). Cohen's d was used as an index of effect size. Cohen defined an effect size of $d = 0.20$ as small, $d = 0.50$ as medium, and $d = 0.80$ as large (Cohen, 1988). Internal consistencies were assessed by Cronbach's α coefficient. Concurrent validity of the Chinese short 46-items version ZKPQ-III-R was examined by correlating five dimensions of the ZKPQ-III-R with measures of depression (BDI), life satisfaction (SWLS), SHC, Big Five personality traits (Mini-IPIP), and the SURPS.

RESULTS

Exploratory Factor Analysis

A principal component analysis with Varimax rotation was performed for the original 89-item ZKPQ-III-R, excluding the 10 Inf subscale items. Five factors were extracted, which explained 27.27% of the total variance. Most of the items were encapsulated in their respective factors according to the original distribution of the questionnaire. The items that loaded in different factors were the following: 30 (ImpSS) loading on N-Anx, 16 and 57 (ImpSS) loading on Agg-Host, 48 and 49 loading on Act, 22 and 63 (ImpSS) loading on Sy, 99 and 23 (N-Anx) loading on Act, 43 (N-Anx) loading on Sy, 95, 50, 84, 89, 1, 19, 45, and 14 (Agg-Host) loading on ImpSS, 44 (Agg-Host) loading on Act, 29, 39, 75, 34, and 45 (Act) loading on ImpSS, 31 and 36 (Act) loading on Agg-Host, 78, 48, 82, 98, 9, 53, and 27 (Act) loading on Sy, 38 (Sy) loading on Act, and 75 (Sy) loading on ImpSS. The following items had loading < 0.30: 6, 50, 29, 39, 75, 84, 34, 89, 1, 19, 45, 14, 85, 2, 36, 47, 16, 86, 57, 31, 62, 21, 94, 99, 44, 88, 49, 23, 38, 78, 48, 82, 98, 9, 53, 27, 92, and 58. All of these items were deleted, and a second factor analysis was performed with the 51 remaining items. Of these, 33.75% of the total variance was explained by extracting five factors. In this analysis, only item 43 had a loading < 0.30, so it was also deleted. Two additional items were deleted because of the following additional criteria (explained in the CFA section). A third factor analysis was performed with the 46 remaining items, and the five factors accounted for 34.22% of the total variance (see Supplementary Table 2).

Confirmatory Factor Analysis

Beginning with the 50-item solution (excluding item 43), an orthogonal CFA was performed over the variance-covariance matrix using MPLUS 7. The maximum likelihood estimation method was used. To achieve model identification, regression coefficients of the error terms over the endogenous variables were fixed to 1. The CFA was performed to test the goodness-of-fit of the five-factor model. This procedure allowed the calculation of error variances among the items. The analysis of error variance showed that four item pairs were highly correlated, and the MIs were > 50. This indicated that there were probably very similar items in the content, so the subjects tended to answer in the same way. The item pairs were the following: 46–51 (MI $= 156.63$, $r =$

TABLE 2 | Fit indices of the independent factors of the 46-item version of the ZKPQ-III-R.

CFA Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA	90% CI	WRMR
ImpSS	26.73	9	2.97	0.97	0.96	0.044	0.025–0.064	0.948
N-Anx	519.35	104	4.99	0.93	0.92	0.063	0.057–0.068	1.714
Agg-Host	142.57	27	5.28	0.93	0.91	0.065	0.055–0.075	1.539
Act	260.37	35	7.44	0.91	0.89	0.079	0.071–0.089	1.882
Sy	55.67	14	3.98	0.97	0.95	0.054	0.040–0.069	1.199

$n = 1019$. All χ^2 values were significant ($p < 0.001$). CFA, confirmatory factor analysis; CFI, comparative fit index; TLI, Tucker-Lewis index; CI, confidence interval; RMSEA, root mean square error of approximation; WRMR, weighted root mean square residual; ImpSS, Impulsive Sensation Seeking; N-Anx, Neuroticism-Anxiety; Agg-Host, Aggression-Hostility; Act, Activity; and Sy, Sociability.

In **Table 1**, the CFA models of the 89-item version, 50-item version, and 46-item version of the ZKPQ-III-R were compared with the original model with regard to (a) the CFA of the 89-item version, 50-item version, and 46-item version, (b) the secondary loadings of the 89-item version, 50-item version, and 46-item version, and (c) the correlated error terms of the 89-item version, 50-item version, and 46-item version. As shown in **Table 1**, the 46-item version comprised items with secondary loadings > 0.20 and error variances with MIs > 50 (33–54, 3–8, 5–33, 28–74, 41–95, 15–41, and 7–20 item pairs).

The goodness-of-fit indices of the simple structure of the ZKPQ-III-R for the 89-item version were generally very low, with the exception of the RMSEA and SRMR. The 89-item version that was derived from the first CFA was nearly identical to the original version. The 50-item version that was obtained from the second CFA yielded fit indices that were slightly better than the previous model. The 46-item version that was derived from the third CFA was also improved compared with the previous models. Both specifications of this model yielded the most acceptable indices, especially $\chi^2/df < 3$ and RMSEA < 0.05 (Byrne, 1993; Yadama and Drake, 1995).

Following the same CFA procedure, **Table 2** shows the goodness-of-fit indicators that were used to separately analyze each of the five independent factors of the 46-item model. In this case, the fit indices were excellent for the ImpSS and Sy subscales and good for the N-Anx, Agg-Host, and Act subscales. These results showed that five factors in the 46-item model were consistent, which was further confirmed when the standardized regression coe□cients were considered.

Descriptive Characteristics

Descriptive characteristics summarizes the means, standard deviations, kurtosis, skewness, *t*-tests, and coe□cients for the 89-item original version of the ZKPQ-III-R, including the Inf scale, and the 46-item shortened version. The criteria for selecting the 46-item model are described below.

In the 89-item version, the means were very similar to those reported by Zuckerman et al. (1993). Men had higher scores than women on ImpSS (9.57 vs. 8.97, $p < 0.01$, $d = 0.16$), Agg-Host (6.85 vs. 6.38, $p < 0.01$, $d = 0.17$), Act (8.14 vs. 7.01, $p < 0.01$, $d = 0.37$), Sy (8.31 vs. 7.54, $p < 0.01$, $d = 0.25$), and Inf (3.49 vs. 2.04, $p < 0.01$, $d = 0.65$). Women had higher scores than men on N-Anx (10.67 vs. 9.64, $p < 0.01$, $d = 0.23$). The α coe□cients were also similar to those reported by Zuckerman et al. (1993), Wu et al. (2000), and Wang et al. (2002), ranging from 0.58 to 0.82 (see Supplementary Table 1).

Descriptive data for the 46-item shortened version of the ZKPQ-III-R had Cronbach's α coe□cients of 0.63 for ImpSS, 0.84 for N-Anx, 0.70 for Agg-Host, 0.73 for Act, and 0.63 for Sy, indicating that the scales of the shortened version maintained internal consistency that was similar to the 89-item original version and 89-item Chinese version. The ratio of kurtosis can be used as a test of normality. According to Curran et al. (1996), for univariate normality, skewness absolute values of 0–2 and kurtosis absolute values of 0–7 can be considered su□cient normality. The kurtosis and skewness values indicated that all of the scales had a normal and symmetrical distribution for both the 89- and 46-item versions of the ZKPQ-III-R.

Correlational Analysis of ZKPQ-III-R with BDI, SWLS, SHC, SURPS, and Mini-IPIP

Table 3 shows two correlation matrices among the five ZKPQ-III-R scales of the original 89-item version and 46-item shortened version. ImpSS yielded moderate correlations with N-Anx, Agg-Host, Act, and Sy (0.43, 0.28, 0.25, and 0.08, respectively; $p < 0.05$). N-Anx was related to Agg-Host, Act, and Sy (0.25, 0.10, and −0.11; $p < 0.05$). Agg-Host was also correlated with Act (0.08; $p < 0.05$), and Act was correlated with Sy (0.31; $p < 0.05$). Inter-correlations of the original 89-item version and 46-item shorted version of the ZKPQ-III-R followed a very similar pattern throughout every scale.

Table 3 also shows the correlation matrix between the ZKPQ-III-R and BDI, SWLS, SHC, SURPS, and Mini-IPIP, including the original 89-item version and 46-item shortened version. Both versions of the ZKPQ-III-R exhibited very similar values. The BDI had moderate correlations with N-Anx (0.36 and 0.33) and Agg-Host (0.26 and 0.24) and somewhat lower negative correlations with Act (−0.10 and −0.07) and Sy (−0.18 and −0.17). The SWLS was negatively correlated with N-Anx (−0.15 and −0.16) and positively correlated with Act (0.10 and 0.14). The SHC was negatively correlated with ImpSS (−0.15 and −0.07), N-Anx (−0.34 and −0.35), and Agg-Host (−0.22 and −0.22) and positively correlated with Sy (0.11 and 0.13). These findings that showed that all of the correlations were significant at $p < 0.05$ were consistent with previous studies (Zuckerman et al., 1993).

The SURPS-H was correlated with N-Anx (0.35 and 0.31). The SURPS-AS was correlated with N-Anx (0.44 and 0.42). The

TABLE 3 | Inter-correlations among the 89-item and 46-item version of the ZKPQ-III-R and Pearson correlation coefficients of ZKPQ-III-R domain scores and BDI, SWLS, SHC, SURPS, and Mini-IPIP scores.

$n = 1019$	ZKPQ-III-R original 89-item					ZKPQ-III-R 46-item				
	ImpSS	**N-Anx**	**Agg-Host**	**Act**	**Sy**	**ImpSS**	**N-Anx**	**Agg-Host**	**Act**	**Sy**
ImpSS	–					–				
N-Anx	**0.43****	–				**0.38****	–			
Agg-Host	0.28**	0.25**	–			0.22**	0.44**	–		
Act	0.25**	0.10**	0.08*	–		**0.31****	0.24**	**0.31****	–	
Sy	0.08*	−0.11**	0.02	**0.31****	–	−0.18*	−**0.31****	−0.27**	−0.17**	–
BDI	0.11**	**0.36****	0.26**	−0.10**	−0.18**	−0.04	**0.33 ****	0.24**	−0.07*	−0.17**
SWLS	−0.08	−0.15**	0.06	0.10*	−0.09*	−0.16**	−0.16**	−0.04	0.14**	0.09*
SHC	−0.15**	−**0.34****	−0.22**	0.02	0.11**	−0.07*	−**0.35****	−0.22**	−0.01	0.13**
SURPS-H	0.04	**0.35****	0.15**	−0.17**	−0.29**	−0.05	**0.31****	0.10	−0.21**	−0.21**
SURPS-AS	0.13*	**0.44****	0.11*	0.01	−0.10	0.07	**0.42****	0.13*	0.03	−0.10
SURPS-IMP	0.26**	0.29**	0.28**	0.09	−0.14**	0.06	0.26**	**0.30****	0.07	−0.17**
SURPS-SS										

than those that were reported elsewhere with several personality structural models that were derived through CFA (Aluja et al., 2003; Rossier et al., 2008). In the 46-item CFA structure, the secondary loadings were low, but the fit improved when correlated error terms were added. When the five factors of the 46-item version of the ZKPQ-III-R were analyzed independently using CFA, the fit indices were adequate, supporting the construct validity of the remaining scales.

In the present study, the 46-item shortened version revealed many intercorrelations among the five dimensions that were considerably larger compared with the 89-item original version. The correlations between the N-Anx and Act dimensions and the other dimensions (i.e., ImpSS, Agg-Host, and Sy) were strengthened. Nonetheless, the intercorrelations among the five dimensions of the 46-version were similar to the 89-item original version.

Convergent validity of the ZKPQ-III-R has been studied using correlational analyses with the BDI, SWLS, SHC, SURPS, and Mini-IPIP. High convergence has been reported between the ZKPQ-III-R and its equivalent scales in the other five instruments, corroborating the outcomes that were found by Zuckerman et al. (1993); Aluja et al. (2003), and Rossier et al. (2008). Correlation magnitudes were very similar to the 89-item original version and 46-item shortened version. Internal consistency coe□cients were acceptable and similar to those in Zuckerman et al. (1993) and other studies with Chinese samples. For the Chinese version of the ZKPQ-III-R, Wu et al. (2000) reported the following internal consistency reliabilities (Cronbach's α) in general Chinese samples: 0.81 for N-Anx, 0.68 for ImpSS, 0.63 for Sy, 0.62 for Agg-Host, and 0.61 for Act. Wang et al. (2002) reported the following internal consistency reliabilities (Cronbach's α) in Chinese college students without siblings: 0.81 for N-Anx, 0.74 for ImpSS, 0.59 for Sy, 0.52 for Agg-Host, and 0.64 for Act. Wang et al. (2004) reported Cronbach's α coe□cients of 0.81 for N-Anx, 0.71 for ImpSS, 0.68 for Act, 0.64 for Sy, and 0.60 for Agg-Host. Chai et al. (2013) reported the following internal consistency reliabilities in Chinese middle school students: 0.81 for N-Anx, 0.68 for ImpSS, 0.63 for Sy, 0.62 for Agg-Host, and 0.61 for Act. The α coe□cient of the 46-item version was also adequate, and the deletion of items did not appear to a□ect the questionnaire's reliability.

The ZKPQ-III-R is widely used in cross-cultural fields. It has been translated and revised in many languages, including French, Spanish, Chinese, and Malaysian, among others. The validity and reliability of the 89-item Chinese adaptation of the ZKPQ-III-R was shown to be similar to the 89-item original version, although some items in the Chinese version loaded on di□erent factors.

The present results showed that the 46-item shortened version had higher validity than and attained similar reliability coe□cients as the 89-item original version and 89-item Chinese version. The present study also found that the 46-item shortened version of the ZKPQ-III-R had adequate internal consistency reliability for all five dimensions. The concurrent validity of the 46-item shortened version of the ZKPQ-III-R was supported by significant correlations with depression, life satisfaction, and SHC. The 46-item shortened version of the ZKPQ-III-R had better fit, similar reliability coe□cients, and slightly better construct and convergent validity than the 89-item version. The present study supports the hypothesis that the alternative five-factor model of the ZKPQ has good reliability with regard to constructs and internal reliability in Chinese adolescents and young adults. The 46-item shortened version of the ZKPQ-III-R may be a useful tool for researchers who need a short assessment of the alternative five-factor.

The present study has several limitations. First, no clear criteria for factor selection were articulated for the EFA, and eigenvalues > 1 appeared to be the sole basis for retaining factors. Second, deleting items based only on a single principal components analysis (PCA) with Varimax rotation may be controversial. Third, the sample consisted of adolescents and young adults only from Anhui and Beijing. Future studies should recruit more participants from other areas in China. Fourth, the present study was data-driven, without considering the relative equilibrium of the number of items in each dimension. This should be addressed in future studies.

AUTHOR CONTRIBUTIONS

DW: Guarantor of integrity of entire study, study concepts, study design, literature research, data acquisition, data analysis/interpretation, statistical analysis, manuscript preparation, and manuscript final version approval. MH: literature research, data acquisition, data analysis/interpretation, statistical analysis, manuscript preparation, manuscript final version approval. CZ: literature research, data analysis/interpretation, statistical analysis, manuscript definition of intellectual content, manuscript editing, manuscript revision, and manuscript final version approval. ZL: literature research, guarantor of integrity of entire study, study concepts, study design, data analysis/interpretation, statistical analysis, manuscript definition of intellectual content, manuscript editing, manuscript revision, and manuscript final version approval.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: http://journal.frontiersin.org/article/10.3389/fpsyg.2017.00349/full#supplementary-material

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