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Reliability and Validity of Warwick-Edinburgh Mental Well-Being Scale among Chinese Civil Servants

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ABSTRACT

The purpose of this study was to explore the reliability and validity of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) among Chinese civil servants, thus establishing a useful tool for assessing the mental health of individuals in this occupation. The WEMWBS, Satisfaction with Life Scale (SWLS), and Depression Anxiety and Stress Scale-21 (DASS-21) were administered to a sample of 2,624 civil servants (42.860 ± 9.690 years) in a city located within Shandong Province, China. The findings revealed significant differences between groups with high and low scores on each item of the WEMWBS ($t = 48.127-78.308$, all $p < 0.01$). The item-total correlation of WEMWBS ranged from 0.752 to 0.911 (all $p < 0.01$). Scree plot and parallel analysis results suggested a one-factor solution with factor loadings ranging from 0.762-0.918, accounting for 73.16% of the total variance. Confirmatory factor analysis supported a single-factor model of the Chinese version of the WEMWBS (CFI = 0.997, TLI = 0.996, RMSEA = 0.0330). The Chinese version of the WEMWBS was positively correlated with the SWLS ($r = 0.710$, both $p < 0.01$) and negatively correlated with depression, anxiety, stress, and total DASS-21 score ($r = -0.512, -0.437, -0.488, -0.497$, all $p < 0.01$). The Cronbach's alpha coefficient and Guttman split-half coefficient of the Chinese version of the WEMWBS were 0.970 and 0.953, respectively. In conclusion, the 14-item Chinese version of the WEMWBS demonstrated strong reliability and validity, establishing its utility as a precise tool for measuring and assessing the mental health status of civil servants in China.

KEYWORDS

Reliability; validity; Warwick-Edinburgh Mental Well-Being Scale; Chinese civil servants

Introduction

Techniques for promoting mental health center on fostering positive psychological well-being through enhancing an individual's competencies, resources, and strengths. "Positive mental health" empowers individuals to actualize their capabilities, effectively manage the everyday stresses of life, engage in productive and meaningful work, develop and maintain mutually fulfilling and long-lasting relationships, and actively contribute to their community [1]. Improving

positive mental health, and its impact on various facets of human life, have gained increasing recognition across the globe. In policy and academic discourse, the terms "positive mental health" and "mental well-being" are frequently utilized interchangeably.

The concept of positive mental health, which focuses on nurturing positive qualities and strengths, is closely intertwined with the beneficial aspects of human nature and variations among individual persons. In essence, developing positive mental health involves enhancing psychological



well-being by mitigating negative qualities and nurturing positive qualities [2]. The pursuit of positive mental health is considered a universal goal, encompassing positive emotions, attitudes, personal traits, goals, and abilities shared by all humans [3]. As a complementary and corrective approach to the traditional model of psychological health research, positive mental health has emerged as a prominent research topic across disciplines such as psychology, psychiatry (behavioral medicine), and public health.

Chinese civil servants hold a profession with several characteristics that are markedly distinct from other types of work. As executors of party and government functions, they face unparalleled psychological demands and challenges to their mental well-being. These challenges stem from the dynamic global landscape, the complexities of modernizing China's social governance systems, the emergence of multifaceted societal conflicts and intricacies, and the imperative to withstand various temptations to engage in corruption for personal gain [4]. The psychological well-being of civil servants not only affects the image and reputation of these workers, but also directly impacts the public trust and satisfaction with the government, thereby directly influencing governance efficacy, societal advancement, and stability [5]. Therefore, focusing on the psychological well-being of civil servants holds significance for both their personal welfare and for society at large.

Currently, the tools primarily used to measure civil servants' mental health revolve around general mental health questionnaires (e.g., GHQ-12) [6], symptom-based self-assessment scales (e.g., SCL-90) [7], self-rating anxiety scales (SAS), and self-rating depression scales (SDS) [8]. These questionnaires mainly gauge symptoms and point to negative outcomes. However, existing research suggests that concentrating solely on problems can yield an incomplete understanding of individuals' true situations and potentially subject them to inappropriate diagnostic labels [9].

According to the principles of positive psychology, while psychologists indeed aim to aid individuals in surmounting challenges, they should also delve into their positive attributes and strengths. This would entail assisting individuals in realizing their potential, effectively managing ordinary life stressors, cultivating effective work habits, establishing gratifying and enduring relationships, and contributing constructively to society [10]. Today, the evolution and advancement of multiple sectors in China necessitate heightened psychological adeptness among civil servants. Conventional symptom-centric assessments fall short of the requirements for contemporary psychological research; further, they do not align with the demands of modern civil services in terms of their effects on mental well-being. There is relatively limited research on positive mental health among civil servants in China, necessitating an applicable positive mental health measurement tool.

The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS), established by Tennant et al. [11], is a widely used tool for measuring positive mental health. It is highly adaptable across cultures and has been translated into over

20 languages, making it applicable across various countries and regions. The scale has been used not only for populations facing psychological challenges, but also among the general populace. The scale's psychometric properties have been substantiated in non-civil servant groups in China, such as the elderly [12], adolescents [13], and medical personnel [14], thus solidifying its suitability as an effective positive mental health assessment tool.

The present study aims to assess the pertinence of the WEMWBS within the civil servant demographic in China, to ascertain its reliability and validity in this specific group, and to proffer a methodologically sound evaluation instrument for both research and practical application within the realm of positive mental health among civil servants.

Methods

Participants

In the year 2022, a research endeavor employing convenient sampling and an online assessment platform was undertaken to assess civil servants within a city in Shandong Province. The civil servants in this study were recruited from among individuals utilizing services provided by the authors' research center. The local organization department invited them via email to voluntarily participate in the psychological health assessment. Participants accessed the research center's customized online assessment platform by following a website URL or scanning a QR code, then completed the questionnaires entirely online.

A total of 3,224 questionnaires were initially collected. Data with missing items and items potentially not answered seriously (e.g., from respondents aged 35 years reporting work experience of 25 years) were methodically excluded. The final dataset consisted of 2,624 valid responses, resulting in a data validity rate of 81.4%. The average age of the participants was 42.860 ± 9.690 years, encompassing 1,663 males and 961 females.

Instruments

WEMWBS [11]

First developed by Tennant et al. in 2007, the WEMWBS comprises 14 items that are scored on a five-point Likert scale ranging from "never" to "always". Score values range from 14 to 70, with higher scores indicating higher levels of positive mental health. The original scale demonstrated Cronbach's alphas of 0.89 and 0.91 in student and general population samples, respectively. The test-retest reliability coefficient is 0.83, and confirmatory factor analysis confirmed the validity of the single-factor structure model.

Several scholars in China have applied the WEMWBS in non-civil servant populations [12,13]. This study compared their Chinese translations with the original English version. With permission from the owners of the English scale, the Brislin back-translation method [15] was used to refine certain components of the translated scale while maintaining consistent scoring with the original English

version. The final Chinese version of the WEMWBS scale that was adapted for this study is, essentially, the same as the versions used by the Chinese authors mentioned above.

Satisfaction with life scale (SWLS) [16]

The SWLS was developed by Xiong et al. in 2009 [16]. This scale includes five items designed to assess an individual's overall satisfaction with life. The items are scored on a five-point Likert scale, with "1" indicating "Strongly Disagree" and "5" indicating "Strongly Agree". Higher scores indicate higher life satisfaction. In this study, the Cronbach's alpha coefficient for SWLS was measured as 0.911.

Depression anxiety and stress Scale-21 (DASS-21) [17,18]

Originally developed by Lovibond et al. in 1995, the DASS-21 was later revised into a shorter version encompassing 21 items. Gong et al. [17] adapted the scale for the Chinese context in 2010. This adaptation was designed to gauge negative emotional experiences within the preceding week over three dimensions: depression, anxiety, and stress. Each dimension consists of seven items, scored on a four-point scale ranging from "Does Not Apply to Me at All" to "Applied to Me Very Much or Most of the Time". Higher scores indicate more severe levels of depression, anxiety, and stress. In this study, Cronbach's alpha coefficients for the total scale as well as depression, anxiety, and stress subscales were 0.975, 0.947, 0.935, and 0.913, respectively.

Statistical analysis methods

Statistical analyses were conducted using SPSS 26 and the Lavaan package (Version 0.6-16) in R software (Version 4.3.1).

When the absolute values of kurtosis and skewness are relatively low, the distribution can be approximated as a normal distribution [19]. Given the substantial sample size utilized in this study, neither the kurtosis nor skewness values exceeded 1. Therefore, it is reasonable to consider them as approximately following a normal distribution.

Pearson's correlations were used to characterize the relationships between variables and independent sample *t*-tests were used to determine significant differences between variables. Principal component analysis and parallel analysis were conducted using random normal data generation. The reliability of the questionnaire was assessed using both the Cronbach's alpha coefficient and Guttman split-half coefficient. Both Cronbach's alpha and Guttman split-half values were ≥ 0.800 , indicating good internal consistency [20].

The total sample was randomly divided into two subsets. Exploratory factor analysis was conducted on Sample 1 ($n = 1,333$) via principal component analysis, and confirmatory factor analysis was performed on Sample 2 ($n = 1,291$) with a robust diagonally weighted least-squares (DWLS) estimation method. The model fit and cut-off criteria were evaluated based on cut-off values indicated in previous structural equation modeling studies [21–23].

According to these criteria, a comparative fit index (CFI) of over 0.950, a Tucker-Lewis fit index (TLI) of over 0.950, and a root mean square error of approximation (RMSEA) under 0.06 were determined, which can be considered acceptable. Statistical significance was identified at the level of $p < 0.05$.

Results

Descriptive statistics of scales

The average total score on the Chinese version of the WEMWBS for 2,624 participants was 54.658, with a standard deviation of 10.990. Independent sample *t*-tests indicated a significant gender difference, with males scoring higher than females. Additionally, one-way ANOVA revealed significant differences in scores based on age and job level. The average WEMWBS score of the group above the division level were significantly higher than those of groups at and below the division level, and there was no significant difference between the scores of the civil servants at the division level and below the division level¹. It is worth noting that civil servants aged 30–39 years scored significantly lower than the other three age groups (Table 1).

Item analyses

Extreme group analysis and item-total correlation were employed to analyze the items. The sample was sorted based on WEMWBS total scores from highest to lowest, with the top 27% and bottom 27% forming the "high" and "low" subgroups, respectively. An independent sample *t*-test was conducted between the high and low subgroups for each entry score in the scale. The analyses revealed significant differences between high and low subgroups for all items ($t = 48.127$ to 78.308 , all $p < 0.01$); the specific data are presented in Table 2, Column 2. The correlation coefficients between the scores of each item and the WEMWBS total score ranged from 0.752 to 0.911 (all $p < 0.01$), as shown in Table 2, Column 3.

Validity analyses

Parallel analysis

Principal component analysis and random normal data generation were used to conduct parallel analysis on the overall sample. A sample size of 2,624 and a random sample size of 1,000 with 14 variables were utilized. The results are depicted in Fig. 1. Only one original data eigenvalue exceeded the average eigenvalue of the random matrix, suggesting that the WEMWBS has a single-factor structure.

¹ In China, civil service positions are typically divided into different levels to reflect their status and responsibilities within government organizations. These levels include the Above Divisional level, which comprises senior managerial positions (e.g., ministers, directors, or high-level executives). These civil servants hold higher-ranking authority and responsibilities within the government system and are often responsible for leading and managing government departments. The Divisional level encompasses intermediate managerial positions, including department heads and section chiefs. Divisional-level civil servants play crucial roles in management and coordination within the government, overseeing specific government functions. The Below Divisional level includes grassroots management positions, such as staff in local government departments, who typically perform operational and executive tasks to support higher-level management. These positional levels are essential for the organization and management of China's government system, contributing to the effective functioning of government functions and services.

TABLE 1
WEMWBS (Chinese version) scores ($n = 2,624$)

Item	Category	n	$\bar{x} \pm s$	t/F value	p -value
Gender	Male	1,663	55.207 \pm 10.798	3.373	<0.001
	Female	961	53.708 \pm 11.300		
Age	Below 30	293	54.949 \pm 11.625	16.396	<0.001
	30–39	642	52.523 \pm 11.366		
	40–49	901	54.424 \pm 11.150		
	50+	788	56.556 \pm 9.878		
Position	Above Divisional Level	777	56.955 \pm 9.834	24.584	<0.001
	Divisional Level	1,131	53.745 \pm 10.893		
	Below Divisional Level	716	53.607 \pm 11.932		

Note: Gender uses t -scores; age and job variables use F scores.

TABLE 2
 t , r , factor loadings, common factor variances of WEMWBS items

Item	t	r	Factor loading	Common factor variance
W1. I've been feeling optimistic about the future.	53.795**	0.795**	0.775	0.600
W2. I've been feeling useful.	57.878**	0.829**	0.830	0.689
W3. I've been feeling relaxed.	58.439**	0.822**	0.818	0.668
W4. I've been feeling interested in other people.	48.127**	0.752**	0.762	0.580
W5. I've had lots of energy.	70.942**	0.874**	0.871	0.759
W6. I've been dealing with problems well.	60.648**	0.864**	0.873	0.762
W7. I've been thinking clearly.	66.387**	0.888**	0.896	0.803
W8. I've been feeling good about myself.	72.160**	0.892**	0.904	0.817
W9. I've been feeling close to other people.	66.403**	0.871**	0.874	0.764
W10. I've been feeling confident.	78.308**	0.911**	0.918	0.844
W11. I've been able to make up my own mind about things.	54.354**	0.830**	0.854	0.729
W12. I've been feeling loved.	67.453**	0.855**	0.850	0.723
W13. I've been interested in new things.	57.814**	0.826**	0.833	0.693
W14. I've been feeling cheerful.	74.280**	0.900**	0.901	0.812

Note: ** $p < 0.01$, similarly below. ' t ' represents the independent sample t -test values for high and low groups, and ' r ' represents the correlation of each item with the total score.

Exploratory factor analysis

Exploratory factor analysis was applied to Sample 1. The results showed a Kaiser-Meyer-Olkin (KMO) value of 0.965. Bartlett's test of sphericity yielded an approximate χ^2 of 20925.98 with 91 degrees of freedom, and $p < 0.001$. These results indicate that the data were suitable for factor analysis. Only one factor exhibited an eigenvalue greater than 1 (10.242, specifically), consistent with the parallel analysis results. This factor accounted for 73.16% of the total variance, with factor loadings ranging from 0.762 to 0.918 and a common factor variance ranging from 0.580 to 0.844 (Table 2, Columns 4–5).

Confirmatory factor analysis

Confirmatory factor analysis of the one-factor model for Sample 2 was conducted using the Robust DWLS method.

The results, CFI = 0.997, TLI = 0.996, and RMSEA = 0.033, indicate that the one-factor model of the Chinese version of WEMWBS fits the data well. The confirmatory factor analysis model is illustrated in Fig. 2.

Concurrent validity

Correlation analysis was used to calculate the correlation coefficients between the Chinese version of the WEMWBS and the dimensions, as well as the total scores of the SWLS and DASS-21 scales. The results are presented in Table 3. The results revealed a significant positive correlation between the total WEMWBS score and the SWLS score. These findings suggest a sound convergent correlation of each item with the total score validity for the WEMWBS.

Additionally, a moderate negative correlation between WEMWBS and negative emotions (depression, anxiety, and

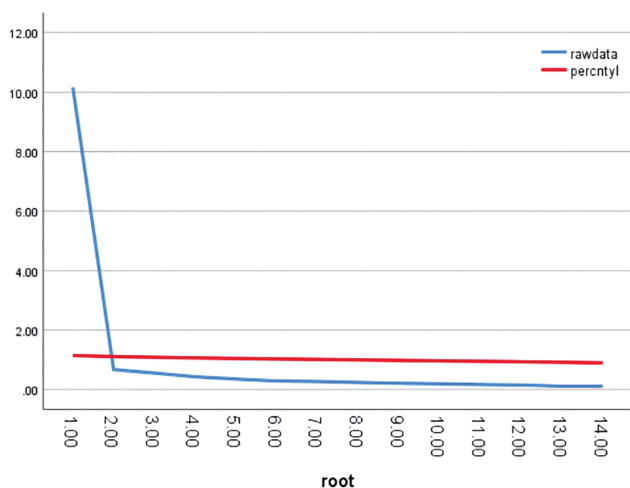


FIGURE 1. Scree plot of actual data and parallel analysis data.

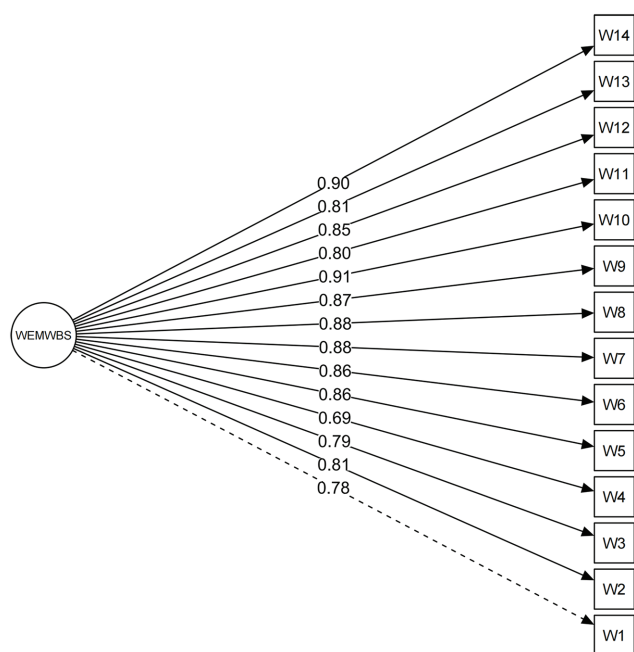


FIGURE 2. Confirmatory factor analysis model.

stress) was identified, indicating favorable discriminant validity for WEMWBS.

Reliability analysis

Cronbach’s alpha and Guttman’s split-half coefficients were used to estimate the internal consistency of the Chinese version of the WEMWBS. The Cronbach’s alpha coefficient was 0.970 and the Guttman’s split-half coefficient was 0.953.

Discussion

The item analysis results indicated that all items of the Chinese version of the WEMWBS exhibit significant differences between high and low subgroups, indicating effective discrimination among respondents for all items and warranting their retention. The Pearson’s correlation coefficients between each item score and the total score range from 0.752 to 0.911, all exceeding 0.5. These correlations are slightly higher than the total item correlations in a previous study on Chinese medical staff (0.727 to 0.900) [14] and markedly higher than those previously applied to Chinese middle school students (0.45 to 0.74) [13], elderly populations (0.58 to 0.84) [12], college students (0.385 to 0.786) [24], caregivers of maintained-hemodialysis patients (0.56 to 0.81) [25], and undergraduate nursing trainees (0.66–0.83) [26]. This not only suggests a high level of consistency between all items of the scale and the construct that it measures in civil servants, but also demonstrates the effectiveness of the Chinese translation developed in this study.

Parallel analysis, as a method for determining the number of retained factors in exploratory factor analysis, demonstrates relatively high objectivity and rigidity, making it more dependable than alternative approaches [27]. In the context of the factor structure pertaining to the Chinese version of the WEMWBS, parallel analysis yielded findings in accordance with the exploratory factor analysis results, thereby substantiating the one-factor structure. This mirrors the analytical outcomes originally presented by Tennant et al. [11], as well as similar investigations on various other national versions of the WEMWBS [28–30] and analogous analyses involving Chinese adolescent [13], elderly [12], and medical staff [14] populations.

Furthermore, confirmatory factor analysis also indicates a good fit of the single-factor structural model with the data. The variance explained by the single factor used in this study is 73.16%, surpassing the variance explanation rates for Chinese middle school students (39.4%) [13] and the elderly (54.77%) [12]. Factor loadings for each item exceed 0.5, ranging from 0.762 to 0.918, which also surpass the results for medical staff [14], middle school student [13], college student [24] and elderly person samples [12].

In summary, the results of this study support the strong structural validity of the Chinese WEMWBS version for use among Chinese civil servants.

The concurrent validity of the Chinese WEMWBS version was examined by comparison against the SWLS. The results indicated a highly positive correlation ($r = 0.710$) between the total scores of the SWLS and the Chinese version of the WEMWBS, reflecting strong

TABLE 3

Correlations between WEMWBS and other construct-related variables

	SWLS	DASS-depression	DASS-anxiety	DASS-stress	DASS-total score
WEMWBS	0.710**	-0.512**	-0.437**	-0.488**	-0.497**

Note: ** $p < 0.01$.

concurrent validity. The correlation coefficient between the Chinese WEMWBS version and SWLS is also higher than those measured previously for middle school students (0.50) [13] and the elderly (0.54) [12].

Distinct validity was examined using the DASS-21. The depression subscale assesses symptoms such as hopelessness, lack of motivation, and low self-esteem; the anxiety subscale evaluates subjective feelings of fear, worry, and physical symptoms. The stress subscale reflects symptoms of relaxation difficulty, nervous tension, irritability, excessive response to stress events, and impatience. The total score and subscale scores of the DASS-21 were found to be moderately negatively correlated with the Chinese WEMWBS version (range of -0.437 to -0.512), suggesting good discriminant validity for the Chinese WEMWBS version when applied to civil servants. The correlation coefficients between the Chinese version of the WEMWBS and the DASS-21 and its subscales are also higher than those reported for middle school students (-0.32 to -0.46) [13].

To fulfill the management department's demand for complete anonymity in the evaluation of civil servants, it was not feasible to collect retest data. Thus, it was not possible to conduct test-retest reliability assessments. Instead, the internal consistency of the scale was estimated using Cronbach's alpha and Guttman's split-half coefficients. The results showed a Cronbach's alpha coefficient of 0.966 for the Chinese WEMWBS version in this study sample, which is largely consistent with the Cronbach's alpha coefficient of 0.96 found previously in a Chinese medical staff population. This coefficient also exceeds Cronbach's alpha coefficients reported for Chinese middle school students [13], elderly individuals [12], undergraduate nursing trainees [14], and international populations [29–30]. Additionally, the Guttman's split-half coefficient is 0.942, satisfying the standards for psychometric assessment.

These findings demonstrate strong internal consistency and stability for the Chinese version of the WEMWBS. However, a Cronbach's alpha value above 0.9 may suggest redundancy in the items. We plan to explore the possibility of developing a shorter version of the scale in the future.

In this study, the Chinese version of the WEMWBS yielded an average score of 54.658 among civil servants, which, while lower than that of caregivers for maintenance hemodialysis patients (58.02) [25], surpasses the scores of two other groups: medical staff assessed during the pandemic (38.47) [14] and university students assessed in 2018 (47.41) [24]. This score also closely approximates the mean score reported by Chinese scholars for the elderly population in 2016 (52.1) [12]. The positive mental health level found to be higher for males than females, which is consistent with results for Norwegian primary care patients [30] and the Danish general population [28] but is inconsistent with results for Chinese elderly populations [12].

Age and job level appeared to significantly influence positive mental health levels among civil servants, with the 30 to 39-year-old age group having the lowest score and those at supervisory levels having higher positive mental health levels compared to those at and below supervisory

levels. The differences in various groups suggest a potentially distinctive mental health landscape for the civil servant population. Further examination of the tool's applicability within this context, and the creation of normative data tailored to civil servants, is warranted for accurate and reliable mental health assessments within this population.

The results of this study confirm that the Chinese version of the WEMWBS satisfies the necessary criteria for both validity and reliability in psychometric assessment, establishing it as a dependable tool for gauging positive mental health levels among Chinese civil servants. These findings also may promote a deeper understanding of positive mental well-being on the whole, as well as offer guidance for further research and service provision related to the mental health of civil servants. Thus, this work contributes not only to the happiness and health of civil servants themselves, but also influences social stability and development through the crucial roles of these workers in social governance.

However, given this study's confined scope to a specific city in Shandong Province, the applicability of these outcomes needs to be further validated. Future research should broaden the sample to encompass various provinces and regions with civil servants for a more comprehensive evaluation of the Chinese WEMWBS version's effectiveness within this population. Additionally, comparative studies with similar instruments could further reveal the advantages and disadvantages of the Chinese WEMWBS version in measuring positive mental health levels.

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Availability of Data and Materials: The data will be provided upon request to the corresponding author.

Ethics Approval: Not applicable.

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