Health and Quality of Life Outcomes

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Evaluation of measurement properties of the Impact of Weight on Quality of Life-Lite (IWQOL-Lite) instrument among Chinese overweight and obese populations

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Abstract

Purpose To evaluate measurement properties of the Impact of Weight on Quality of Life-Lite (IWQOL-Lite) instrument among Chinese overweight and obese populations.

Methods A representative sample of Chinese overweight and obese populations was recruited stratified by age, sex, residence and body mass index (BMI). Social-demographic characteristics, self-reported EQ-5D-5 L and IWQOL-Lite responses were collected through the online survey. Test-retest reliability was assessed using intraclass correlation coefficient (ICC) among a subgroup of the total sample. Structural validity was evaluated by confirmatory factor analysis (CFA). Convergent validity and known-group validity were examined using Spearman's rank correlation and effect sizes, respectively.

Results A total of 1000 respondents (48% female; mean age: 51.7 years; mean BMI: 27.4) were included in this study. Ceiling and floor effects of the IWQOL-Lite were 5.4% and 0.67%, respectively. The ICC between the two tests was 0.992 for IWQOL-Lite among the subgroup ($N = 150$). The results of the CFA suggested that the five-factor model had an acceptable structural validity (GFI = 0.894, CFI = 0.960, TLI = 0.957, RMSEA = 0.054 and SRMR = 0.033). The Spearman's rank correlation (range: 0.413–0.611) indicated a satisfactory convergent validity. The effect sizes values of IWQOL-Lite total score and different dimensions were moderate.

Conclusions The IWQOL-Lite has been demonstrated to have satisfactory validity and reliability in measuring the HRQoL of Chinese overweight and obese populations. Further research is needed to confirm the sensitivity and responsiveness.

Highlights

- Overweight and obesity are one of the major public health problems worldwide, with serious negative impacts on health-related quality of life (HRQoL). The impact of weight on quality of life-lite (IWQOL-Lite) is

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a widely used measure to evaluate HRQoL for overweight and obese populations. However, no study has validated the measurement properties of the IWQOL-Lite among Chinese population.
- Our study aimed to evaluate the measurement properties of the IWQOL-Lite in China. We evaluated several measurement properties, including ceiling and floor effects, test-retest reliability, structural validity, convergent validity and known-group validity, of the IWQOL-Lite in a representative sample of Chinese overweight and obese individuals.
- We found that the IWQOL-Lite is a valid and reliable tool for measuring the HRQoL of overweight and obese populations in China. This supports the use of the IWQOL-Lite in overweight and obese populations in the future.

Keywords Health-related quality of life, IWQOL-Lite, Measurement properties, Overweight, Obesity, China

Introduction

Overweight and obesity are major global public health challenges [1], with a rapidly increasing prevalence rate during the past four decades in China [2]. Around 38% of the population worldwide (2.6 billion) is affected by overweight and obesity currently, and it is expected to reach 50% (4.0 billion) in 2035 [3]. The criteria for overweight and obesity based on Body mass index (BMI) in China are $24 \leq BMI < 28$ and $BMI \geq 28$, respectively [4]. According to the Report on the Nutrition and Chronic Diseases Status of Chinese Residents 2020, over 50% of the Chinese adults had either overweight or obesity [5]. Overweight and obesity are associated with negative consequences (e.g. physical and mental functional impairment, increased risk of chronic disease or death) that have both immediate and long-term implications on health and health-related quality of life (HRQoL) [6–8].

HRQoL has been widely used as a multidimensional concept that could be used to assess an individual's health status based on physical, psychological, and social function [9, 10]. While generic measures of HRQoL (e.g. EQ-5D [11], the short form six-dimension [SF-6D] [12]) could offer important information about changes in overall health, it is often recommended that they should be accompanied by disease-specific HRQoL measures [13, 14]. Disease-specific HRQoL measures focus on the domains most relevant to a particular disease such as overweight or obesity, and in addition, they are usually more sensitive to small changes that occur in treatment than generic ones [15–18].

The impact of weight on quality of life-lite (IWQOL-Lite) is a 31-item, disease-specific measures of HRQoL for overweight and obese population [19]. The IWQOL-Lite is a self-report measure that provides scores on five dimensions (physical function, self-esteem, sexual life, public distress, and work) and a total score, ranging from 0 to 100 [20]. The IWQOL-Lite has been translated from the original English into numerous languages, including Portuguese, Spanish, German, and Chinese. The non-Chinese versions of IWQOL-Lite have been proven to have good internal consistency reliability, test-retest reliability, structural validity, discriminant validity, known-group validity and responsiveness [19, 21–26]. Although the Chinese version of IWQOL-Lite has been developed and used in some clinical trials as primary or secondary outcomes [27–30], no studies have validated the measurement properties of it to endorse future use. Some scholars suggested that more research is needed regarding the measurement properties of the IWQOL-Lite when applied to overweight and obese populations, since this would provide a more in-depth understanding of the instrument itself, as well as the HRQoL of populations [31].

Therefore, the aim of this study was to evaluate the measurement properties of the Chinese version of IWQOL-Lite in a representative sample of Chinese overweight and obese population.

Methods

Study sample

The data used in this analysis were obtained from a nationwide online survey (target $N=1{,}000$) investigating the health status of overweight and obese population in China. The survey was conducted from January 2022 to February 2022. Recruitment of the respondents was conducted through a professional online panel company using quota sampling stratified by age, sex, BMI and area of residence (Northeast, East, North, Central, South, Southwest and Northwest in China) [32]. Respondents were also required to meet the following inclusion criteria: (1) age ≥ 18 years; (2) $BMI \geq 24.0$ kg/m^2; (3) had no cognitive burden and could independently use online devices; and (4) gave informed consent.

Data collection

All eligible respondents were invited to complete a self-reported online survey through computer or mobile device. Information on social-demographic (e.g. ethnic, education level, marital status and employment status); health-related questions including a 4-level categorized self-report health status (very good, good, general, poor), presence of chronic diseases, smoking and alcohol consumption status, fruit and vegetable intake, high-fat and high-sugar food intake and weekly exercise time; and

HRQoL assessed by the EQ-5D-5 L and IWQOL-Lite were collected (fixed order). A quality control (QC) question by asking a simple calculation question "7+4 = ?" was also included in this survey. Records giving incorrect answers to the QC question or identified with duplicate IP address were excluded.

A subset of respondents (target $N=150$) was recruited to assess the test-retest reliability of both measures. After the first survey (test), the interviewers randomly asked for the respondents' consent to be online interviewed again (retest) and collected the contact information. The interval between the test and retest was set as two weeks [33, 34]. In the retest interview, respondents completed the same two HRQoL measures (EQ-5D-5 L and IWQOL-Lite) as in the first interview. During the retest interview, the respondents were asked the question "Have there been any changes in your health status compared with the last interview?" and rated on a 5-level Likert scale ("no change", "slightly change", "some change", "much change", or "extremely change"). The respondents who reported "no change"or "slightly change" were regarded to have relatively stable health over the two tests and included in the data analysis [33, 35].

The protocol of this study was approved by the Academic Ethics Committee at Tianjin University (No. 20220211). Informed consent was obtained from all respondents included.

Measures of HRQoL

The EQ-5D-5L descriptive system comprises five dimensions, namely, mobility, self-care, usual activities, pain/discomfort, and anxiety/depression, each with five levels of severity (no, slight, moderate, severe, and extreme problems) [36]. The EQ-5D-5L defines 3,125 ($=5^5$) different health states according to all the possible combinations of dimension levels, with 11,111 being the best health state (full health) and 55,555 being the worst health state [36]. The Chinese EQ-5D-5L utility value set was developed using the time trade-off (TTO) approach and utility values for the 3,125 health states ranged between −0.391 (55555) to 1 (11111) [37].

The IWQOL-Lite is a self-report disease-specific HRQoL measure for overweight and obese populations, which comprises 31 items referring to 5 dimensions (physical function [11 items], self-esteem [7 items], sexual life [4 items], public distress [5 items] and work [4 items]) [19]. Most items on the IWQOL-Lite begin with 'Because of my weight' and include five levels of response, ranging from 1 (never true) to 5 (always true). The dimension and total scores of IWQOL-Lite are standardized and range from 0 to 100, with higher scores representing better weight-related quality of life [19, 20].

Statistical analysis

Descriptive statistics

Descriptive statistics were used to describe the characteristics of respondents, and the HRQoL score of the EQ-5D-5 L and IWQOL-Lite. Categorical variables were reported as the frequency and percentage. Continuous variables were described as the means and standard deviations (SD). The differences between test and retest respondents' characteristics were tested using the one-way analysis of variance (ANOVA) for continuous variables and chi-squared test for categorical variables and presented within tables.

Measurement properties of the IWQOL-Lite

The measurement properties evaluated in this study included the ceiling and floor effects, test-retest reliability, structural validity, convergent validity and known-group validity of the IWQOL-Lite.

Ceiling and floor effects Ceiling and floor effects for the IWQOL-Lite were assessed by examining the percentage of respondents in the best (100) and worst (0) health states, respectively. These effects are considered existing if over 15% of the respondents achieved either extreme end of the scale [38].

Test-retest reliability Test-retest reliability for the IWQOL-Lite was assessed based on the retest sample ($N=150$) using intraclass correlation coefficient (ICC), which was computed with the two-way mixed-effects model based on absolute agreement. ICC above 0.7 suggests a great test-retest reliability [39].

Structural validity Structural validity was evaluated by confirmatory factor analysis (CFA). Items with factor loadings below 0.30 were subject to elimination [40]. Factor tests, including Bartlett test of sphericity and Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, were conducted before the CFA. Only when the p-value<0.05 and KMO>0.9, the CFA could be done [41]. Five fit indices were used to assess model fit, including the goodness of fit index (GFI), the comparative fit index (CFI), Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). Guidelines suggest that models with GFI, CFI and TLI close to 0.9 or higher, RMSEA and SRMR close to 0.06 or lower are representative of adequate fit of the model [42, 43].

Convergent validity Convergent validity was assessed by computing Spearman's rank correlation coefficient (r) between IWQOL-Lite and EQ-5D-5 L dimensions. Besides, the correlation between the IWQOL-Lite total score and EQ-5D-5 L utility value was also calculated. An absolute coefficient value greater than 0.5 stands for a strong correlation, values between 0.35 and 0.49 for moderate, values between 0.2 and 0.34 for weak, and values smaller than 0.2 for poor correlation [44]. Several

hypotheses were proposed before the analysis: (1) The IWQOL-Lite physical function scale was predicted to be associated with the EQ-5D-5 L mobility, self-care, usual activity and pain/discomfort; (2) The IWQOL-Lite self-esteem and public distress scales were predicted to be associated with the EQ-5D-5 L anxiety/depression; (3) The IWQOL-Lite total score was predicted to be associated with the EQ-5D-5 L utility value.

Known group validity Known group validity was assessed using ANOVA and Scheffe post hoc test to analyze possible differences in IWQOL-Lite scores across different sub-groups. It was hypothesized that the IWQOL-Lite scores showed increasing impairment with higher BMI, poorer self-report health status and more chronic diseases. The differences on the IWQOL-Lite scores between the sub-groups with extreme scores were evaluated by effect sizes (ES). Generally, an effect size value of 0.20 is defined as small, 0.50 as medium, and 0.80 as large.

STATA 15.0 (StataCorp LLC, College Station, TX, USA) was used to perform the statistical analyses. All reported statistical tests were performed two-sided with a significance level of 0.05.

Results

Descriptive statistics

A total of 1000 respondents were included in this study. As shown in Tables 1, 52.0% (N=520) of total respondents were male, the mean (SD) age was 51.7 (15.3) years, the mean (SD) BMI was 27.4 (2.8). The distributions of age, sex, and area of residence of respondents were comparable with those of the Chinese overweight and obese population [32, 45]. The mean (SD) utility values of EQ-5D-5 L and IWQOL-Lite were 0.851 (0.195) and 78.5 (20.0) ranging from −0.184 to 1 and 6 to 100, respectively.

Measurement properties of the IWQOL-Lite

Ceiling and floor effects

The proportion of respondents reporting the best state (100) of IWQOL-Lite was 5.4% (N=54), while only 0.2% (N=2) of respondents reported the worst state (0) in the test sample (N=1000). In retest sample, no respondent reported the best state of IWQOL-Lite, and only 0.67% (N=1) respondent reported the worst state.

Test-retest reliability

As shown in Tables 1, 150 retest respondents were included in this study. Among the 150 retest sample, 48.7% answered "no change" in their health status and 51.3% answered "slightly change". The majority of the respondents were male (56.7%), mean (SD) age of 50.6 (15.1) years. Comparable characteristics were observed between the total group and the retest group, except for marital status (p=0.037) and weight loss therapy (p=0.017) (Table 1).

Table 2 displays the ICC of each item and the total score. Test-retest ICCs ranged from 0.977 (sexual life) to 0.986 (public distress) for IWQOL-Lite scales and was 0.992 for the total score. For the overweight sub-sample, ICCs ranged from 0.971 (physical function and sexual life) to 0.983 (self-esteem) for IWQOL-Lite scales and was 0.989 for the total score. While for obese sub-sample, test-retest ICCs ranged from 0.988 (sexual life) to 0.992 (public distress) for IWQOL-Lite scales and was 0.996 for total score. These data suggest that the test-retest reliability of the IWQOL-Lite scales and total score is excellent for both the total sample and the overweight/obese participants, the larger the BMI subgroup, the better the test-retest reliability.

Structural validity

The result showed a Kaiser-Meyer-Olkin value of 0.987 (above the recommended value of 0.9) and a significant value for Bartlett test of sphericity (p<0.001). Table 3 shows the CFA of the scores for all items. Factor loadings of items to the corresponding factor were all considered acceptable, which indicates the internal consistency of the IWQOL-Lite. Five fit indices were used to evaluate the overall model fit: GIF=0.894, CFI=0.960, TLI=0.957, RMSEA=0.054 and SRMR=0.033, except for GIF lower than 0.9, other indices suggesting that the IWQOL-Lite achieved acceptable construct validity.

Convergent validity

Consistent with predictions, the physical function scale from the IWQOL-Lite correlated greater than 0.5 (absolute value) with the mobility (r=-0.566), self-care (r=-0.521), usual activity (r=-0.611) and pain/discomfort (r=-0.597) from the EQ-5D-5 L (Table 4). Also consistent with predictions, the IWQOL-Lite self-esteem and public distress scales correlated with anxiety/depression of the EQ-5D-5 L. The IWQOL-Lite total score correlated most strongly with the EQ-5D-5 L utility value (r=0.702, p<0.001).

Known group validity

As reported in Table 5, the IWQOL-Lite scores were significantly different (p<0.001) across groups divided by BMI, with effect sizes ranging from 0.421 to 0.662. Effect size values of IWQOL-Lite total score and different dimensions were moderate, except for self-esteem dimension (0.421). The discriminative capacity for IWQOL-Lite scores among different self-report health status and numbers of chronic disease sub-groups were also evaluated and significantly different (p<0.001) across groups (Appendix Table 1 and 2).

Table 1 Characteristics of total and test-retest respondents

Characteristics	Total respondents (*N* = 1000)		Test-retest respondents (*N* = 150)		*P* value
	N	%	*N*	%	
Sex[a]					0.215
Male	520	52.0%	85	56.7%	
Female	480	48.0%	65	43.3%	
Age (mean[SD])	51.7 (15.3)		50.6 (15.1)		0.789
Age group (years)[a]					0.306
18–34	174	17.4%	28	18.7%	
35–44	162	16.2%	26	17.3%	
45–54	192	19.2%	27	18.0%	
55–64	179	17.9%	34	22.7%	
≥ 65	293	29.3%	35	23.3%	
Residence (Geographical division)[a]					0.710
North	184	18.4%	25	16.7%	
Northeast	173	17.3%	22	14.7%	
East	134	13.4%	20	13.3%	
Central	136	13.6%	22	14.7%	
South	96	9.6%	20	13.3%	
Southwest	131	13.1%	20	13.3%	
Northwest	146	14.6%	21	14.0%	
BMI[b]**(mean[SD])**	27.4 (2.8)		27.2 (2.7)		0.814
BMI group[a]					0.158
24 ≤ BMI<28	677	67.7%	109	72.7%	
BMI ≥ 28	323	32.3%	41	27.3%	
Residence					0.602
Urban area	832	83.2%	127	84.7%	
Rural area	168	16.8%	23	15.3%	
Ethnic group					0.745
Han	977	97.7%	146	97.3%	
Minority	23	2.3%	4	2.7%	
Education					0.207
Primary or below	196	19.6%	22	14.7%	
Junior high school	312	31.2%	43	28.7%	
Senior high school	338	33.8%	58	38.7%	
College or above	154	15.4%	27	18.0%	
Marital status					**0.037**[c]
Unmarried	81	8.1%	20	13.3%	
Married	890	89.0%	126	84.0%	
Divorced	12	1.2%	3	2.0%	
Widowed	17	1.7%	1	0.7%	
Employment status					0.988
Employed	683	68.3%	103	68.7%	
Retired	284	28.4%	42	28.0%	
Student	11	1.1%	2	1.3%	
Unemployed	22	2.2%	3	2.0%	
Personal monthly income					0.672
<2000 RMB	70	7.0%	11	7.3%	
2000–5000 RMB	386	38.6%	52	34.7%	
5000–10,000 RMB	444	44.4%	69	46.0%	
>10,000 RMB	100	10.0%	18	12.0%	
Basic medical insurance					0.750
Urban employee	811	81.1%	125	83.3%	
Urban and rural resident	174	17.4%	23	15.3%	
No	15	1.5%	2	1.3%	

Table 1 (continued)

Characteristics	Total respondents (*N* = 1000)		Test-retest respondents (*N* = 150)		*P* value
	N	%	*N*	%	
Commercial insurance					0.235
Yes	88	8.8%	17	11.3%	
No	912	91.2%	133	88.7%	
Self-report health status					0.898
Poor	167	16.7%	24	16.0%	
General	440	44.0%	63	42.0%	
Good	314	31.4%	51	34.0%	
Very good	79	7.9%	12	8.0%	
Hypertension					0.969
Yes	292	29.2%	44	29.3%	
No	708	70.8%	106	70.7%	
Diabetes					0.608
Yes	89	8.9%	15	10.0%	
No	911	91.1%	135	90.0%	
Hyperlipidemia					0.183
Yes	327	32.7%	42	28.0%	
No	673	67.3%	108	72.0%	
Number of chronic diseases					0.276
0	410	41.0%	66	44.0%	
1	182	18.2%	22	14.7%	
2	169	16.9%	30	20.0%	
3	96	9.6%	9	6.0%	
≥ 4	143	14.3%	23	15.3%	
Weight loss therapy					**0.017**[c]
Yes	231	23.1%	46	30.7%	
No	769	76.9%	104	69.3%	
Smoking status					0.357
Never smoked	588	58.8%	85	56.7%	
Used to smoke	239	23.9%	33	22.0%	
Smoking now	173	17.3%	32	21.3%	
Drinking status					0.188
Never drink	393	39.3%	69	46.0%	
Used to drink	243	24.3%	33	22.0%	
Drinking now	364	36.4%	48	32.0%	
Exercise duration/week					0.455
≤ 3.5 h	568	56.8%	81	54.0%	
3.5–7.5 h	395	39.5%	61	40.7%	
≥ 7.5 h	37	3.7%	8	5.3%	
Fruit and vegetable intake					0.650
Rarely intake	174	17.4%	30	20.0%	
Sometimes intake	338	33.8%	50	33.3%	
Often intake	488	48.8%	70	46.7%	
High sugar oil food intake					0.935
Rarely intake	152	15.2%	22	14.7%	
Sometimes intake	473	47.3%	73	48.7%	
Often intake	375	37.5%	55	36.7%	
Sleep duration/day					0.077
<7 h	579	57.9%	77	51.3%	
≥ 7 h	421	42.1%	73	48.7%	

Table 1 (continued)

Characteristics	Total respondents (*N* = 1000)		Test-retest respondents (*N* = 150)		*P* value
	N	%	*N*	%	
EQ-5D-5 L utility (mean[SD])	0.851 (0.195)		0.842 (0.173)		
IWQOL-Lite score (mean[SD])	78.5 (20.0)		76.9 (17.8)		

[a]The quota sampling was used in this study, which four quotas, i.e., sex, age group, residence (geographical division), and BMI group

[b]BMI body mass index, equals weight(kg) divided by height(m) squared

[c]$P<0.05$

Table 2 Test-retest reliability of the IWQOL-Lite instrument (*N* = 150)

IWQOL-Lite	ICC* (95% CI)	*P* value
Total	0.992 (0.975, 0.996)	< 0.001
Physical function	0.980 (0.954, 0.989)	< 0.001
Self-esteem	0.985 (0.980, 0.990)	< 0.001
Sexual life	0.977 (0.960, 0.986)	< 0.001
Public distress	0.986 (0.980, 0.990)	< 0.001
Work	0.981 (0.972, 0.987)	< 0.001

[a] ICC above 0.7 suggests a strong test-retest reliability

Abbr: 95%CI 95% confidence interval, ICC intraclass correlation coefficient

Discussion

The aim of this study was to evaluate the psychometric properties of the Chinese version of the IWQOL-Lite. Data from the present study demonstrate that the Chinese version of the IWQOL-Lite exhibits good psychometric properties regarding test-retest reliability, structural validity, convergent validity and discriminant validity. This indicates the IWQOL-Lite is suitable for use in the overweight and obese population in China.

The principal component factor analysis in our study yielded findings different from those reported in earlier studies but similar with Germany [23–25, 46, 47], 4 of the 5 factors ('physical function', 'self-esteem', 'sexual life', 'public distress') could be replicated whereas the fifth factor ('work') did not arise (Appendix Table 3). According to previous studies, we decided not to modify the 5-factor structure for the Chinese version to facilitate comparison with other international studies. The CFA was accordingly performed based on a 5-factor structure original model and provided an acceptable fit.

Convergent validity was also proved acceptable between IWQOL-Lite and EQ-5D-5 L. In previous studies conducted in American, Brazilian, Malay and Portuguese validation studies [21, 23, 46, 47], correlation was calculated between IWQOL-Lite scores and the 36-item short-form health survey (SF-36) domains. The results were found that IWQOL-Lite subscale 'physical function' highly correlated with the SF-36 physical component summary score, and the IWQOL-Lite subscale 'self-esteem' had a high correlation with the SF-36 mental component summary score. In our study, similar hypotheses were proposed between IWQOL-Lite and EQ-5D-5 L dimensions and also found strong correlation (r from −0.521 to -0.611).

Test-retest reliability coefficients were computed firstly for all subjects and then for overweight and obese subjects. The coefficients of our all sample were higher than that reported in previous studies conducted in Brazil, Malaysia and the United States [21, 23, 47, 48], for example, the ICC of total score ranged from 0.91 to 0.94 in those studies. In this study, we found that the obese subgroup showed larger test-retest coefficient relative to the overweight subgroup, and similar results have been found in the study in the United States, demonstrating that the higher the BMI, the better the test-retest reliability. The potential reason could be that individuals with a higher BMI may be more sensitive to measurement items due to their poorer health status, potentially resulting in more similar results in retest.

Our study demonstrated IWQOL-Lite was able to distinguish between populations with different levels of self-report health status and numbers of chronic disease on subscales and the total score. However, IWQOL-Lite was not sensitive enough (ES < 0.8) to differentiate overweight and obese respondents in BMI subgroups in our study, which was different from a previous study conducted in Spain [25]. Our study reported smaller effect size (0.421–0.662) than that in Spanish study (0.769–1.401) in all domains and total score, the possible reason might be the sample in Spanish study were patients awaiting bariatric surgery and had higher BMI than respondents in our study [25]. Furthermore, the lack of correlations between self-esteem, sexual life domains and BMI among severely obese patients has been found in the Spanish study, which was similar to our study that self-esteem showed the smallest effect size (0.421) [25]. Future research could examine the sensitivity of IWQOL-Lite and correlations between specific domain and BMI, especially in obese patients with treatment.

There are a few limitations to this study. First, we only focused on adults while did not include adolescents with high prevalence of overweight and obesity, which may have an impact on the representativeness of overweight and obesity in China. Second, we recruited sample from an online panel that may be subject to selection bias, which may influence the findings of this study. Third, although we conducted the test-retest based on

Table 3 Factor loadings of the Chinese version of IWQOL-Lite items to factors ($N = 1,000$)

IWQOL-Lite	Factors				
	Physical function	**Self-esteem**	**Sexual life**	**Public distress**	**Work**
Physical function					
Picking up objects	0.864				
Tying shoes	0.825				
Getting up from chairs	0.869				
Using stairs	0.616				
Dressing	0.805				
Mobility	0.793				
Crossing legs	0.836				
Feel short of breath	0.811				
Painful stiff joints	0.859				
Swollen ankles/legs	0.873				
Worried about health	0.848				
Self-esteem					
Self-conscious		0.765			
Self-esteem not what it could be		0.859			
Unsure of self		0.835			
Do not like myself		0.874			
Afraid of rejection		0.856			
Avoid looking in mirrors		0.852			
Embarrassed in public		0.849			
Sexual life					
Do not enjoy sexual activity			0.865		
Little sexual desire			0.856		
Difficult with sexual performance			0.867		
Avoid sexual encounters			0.833		
Public distress					
Experience ridicule				0.867	
Fitting in public seats				0.879	
Fitting through aisles				0.856	
Worry about finding suitable chairs				0.874	
Experience discrimination				0.882	
Work					
Trouble accomplishing things					0.867
Less productive than could be					0.745
Do not receive recognition					0.856
Afraid to go on interviews					0.827

* Factor loadings of items to the corresponding factor were considered acceptable when reaching 0.30

Table 4 Correlations between IWQOL-Lite and EQ-5D-5 L ($N = 1,000$)

IWQOL-Lite	EQ-5D-5 L				
	Mobility	**Self-care**	**Usual activity**	**Pain/Discomfort**	**Anxiety/Depression**
Physical function	**-0.566**	**-0.521**	**-0.611**	**-0.597**	-0.549
Self-esteem	-0.478	-0.413	-0.510	-0.525	**-0.601**
Sexual life	-0.540	-0.508	-0.589	-0.527	-0.497
Public distress	-0.542	-0.490	-0.593	-0.529	**-0.559**
Work	-0.541	-0.504	-0.590	-0.543	-0.557

* $r > 0.5$ represents a strong correlation. All the p values of the correlations were lower than 0.001

Table 5 Discriminative capacity and univariate analyses for IWQOL-Lite scores among different BMI sub-groups ($N = 1{,}000$)

	Mean (SD)				*P* value	Scheffe post hoc test	Effect size [a] (95% CI)
	I: $24 \leq$ BMI < 26 ($N=406$)	II: $26 \leq$ BMI < 28 ($N=271$)	III: $28 \leq$ BMI < 30 ($N=151$)	IV: BMI ≥ 30 ($N=172$)			
Total score	82.9 (17.1)	79.0 (17.6)	71.2 (23.9)	73.5 (23.1)	< 0.001	I > III***, I > IV***, II > III**, II > IV*	0.615 (0.424, 0.805)
Physical function	83.6 (16.6)	79.2 (18.2)	70.9 (25.1)	73.8 (23.6)	< 0.001	I > II*, I > III***, I > IV***, II > III**, II > IV*	0.662 (0.471, 0.853)
Self-esteem	78.8 (21.5)	76.0 (20.2)	69.3 (25.4)	69.6 (25.4)	< 0.001	I > III***, I > IV***, II > III*, II > IV*	0.421 (0.233, 0.610)
Sexual life	83.7 (18.7)	79.2 (19.8)	71.4 (26.8)	75.4 (25.9)	< 0.001	I > III***, I > IV**, II > III**	0.580 (0.390, 0.770)
Public distress	85.5 (20.4)	82.1 (20.0)	73.6 (26.7)	75.9 (25.3)	< 0.001	I > III***, I > IV***, II > III**, II > IV*	0.533 (0.344, 0.773)
Work	84.5 (18.8)	79.9 (19.7)	72.0 (25.8)	74.5 (25.3)	< 0.001	I > III***, I > IV***, II > III**	0.596 (0.405, 0.786)

One-way analyses of variance and Scheffe post hoc tests were performed to compared the IWQOL-Lite scores among different BMI sub-groups

BMI: Body Mass Index, equals weight(kg) divided by height(m) squared. BMI groups were defined according to the guideline published by the Cooperative Meta-analysis Group of China Obesity Task Force in 2002

[a] The effect size was calculated as the difference between the mean scores of two sub-groups divided by the pooled standard deviation. An effect size of 0.8 is defined as large, 0.5 to 0.79 as moderate, and 0.2 to 0.49 as small

$^{*}p<0.05$; $^{**}p<0.01$; $^{***}p<0.001$

the longitudinal data, it was not possible to evaluate and compare the longitudinal responsiveness. And this study did not analyze the respondents with treatment, which is an important application context of the IWQOL-Lite. Further investigations using longitudinal data are required to detect any significant changes over time among patients engaged in treatment.

Conclusions

The Chinese version of the IWQOL-Lite has been demonstrated to have satisfactory validity and reliability in measuring the HRQoL of Chinese overweight and obese population. Further effort is needed to confirm the sensitivity and responsiveness.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12955-024-02313-3.

Supplementary Material 1

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Author contributions

Concept and design: SX and JW. Acquisition of data: XL and SX. Analysis and interpretation of data: XL, TH, and SX. Drafting of the manuscript: XL, CL, and SX. Statistical analysis: XL, TH, CL and SX. Obtaining funding: SX and JW. Supervision: JW. All authors commented on previous versions of the manuscript and approved the final manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Role of the Funder

The funder had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Conflicts of interest/Competing interests

JW reported receiving grants from the National Natural Science Foundation of China during the conduct of the study. SX reported receiving grants from the Natural Science Foundation of Tianjin, China. No other conflicts of interest were reported by the authors.

Consent to participate

Informed consent was obtained from all individual participants included in the study. Participants were informed about their freedom of refusal. Anonymity and confidentiality were maintained throughout the research process.

Ethics approval and consent to participate
This study was approved by the Academic Ethics Committee at Tianjin University (No. 20220211) and was conducted in accordance with the Declaration of Helsinki.

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