

Development and Content Validity of the Wellbeing of Life Questionnaire for Overweight Adolescents

Dr. Sonia Bhatia^{1*}, Dr. Sandipkumar Parekh²

¹PhD Scholar, Faculty of Physiotherapy, Parul University, Waghodia, Vadodara 391760, Gujarat, India.

Email: bhatia_sonia205@yahoo.com; ORCID: <https://orcid.org/0009-0004-3360-3331>

²Professor & PhD Guide, Faculty of Physiotherapy, Parul University, Waghodia, Vadodara 391760, Gujarat, India

HOW TO CITE:

Sonia Bhatia, Sandipkumar Parekh² (2026). Development and Content Validity of the Wellbeing of Life Questionnaire for Overweight Adolescents. International Journal of Special Education, 41(19s), 290-297

COPYRIGHT STATEMENT:

Copyright: © 2026 Authors.
Open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

ABSTRACT:

Aim: To develop a multidimensional Wellbeing of Life Questionnaire (WOL-Q) targeting five health-related quality of life (HRQoL) domains and evaluate its content validity and factorial structure in adolescents classified as overweight.

Materials and Methods: A methodological psychometric study following COSMIN recommendations was conducted. A 31-item instrument was developed targeting Physical Functioning, Emotional Functioning, Social Functioning, Environmental Factors, and School Functioning. Six domain experts evaluated content validity using Item-Level Content Validity Index (I-CVI) and Scale-Level Content Validity Index (S-CVI/Ave). A consecutive sample of 200 adolescents classified as overweight (Asian BMI 23.0-24.9 kg/m²; aged 13-18 years) was recruited. Item analysis (corrected item-total correlations, Cronbach's alpha) and exploratory factor analysis (EFA; principal axis factoring, varimax rotation) with parallel analysis were conducted on a calibration subsample (n=100).

Results: Content validity was excellent (S-CVI/Ave=0.955; all I-CVI>=0.80). Six items with corrected $r<0.20$ were excluded. Parallel analysis confirmed five-factor retention. EFA explained 56.6% of variance. Tucker's congruence confirmed factor replicability (M=0.991). Overall Cronbach alpha=0.836.

Conclusion: The 25-item WOL-Q demonstrated excellent content validity and a stable five-factor structure, representing the first HRQoL instrument for adolescents classified as overweight using Asian BMI criteria.

Keywords: adolescent; overweight; quality of life; psychometrics; factor analysis, statistical

Introduction

Adolescent overweight is a major global public health challenge. The World Health Organization reported that overweight and obesity among those aged 5-19 years exceeded 18% in 2022, affecting over 340 million individuals worldwide (1). In low

and middle income countries, overweight co-exists with undernutrition, creating a dual burden (2).

Excess adiposity impairs HRQoL across physical, psychological, social, and educational domains (3,4). Despite this multidimensional

burden, no existing instrument simultaneously covers five relevant domains – Physical Functioning, Emotional Functioning, Social Functioning, Environmental Factors, and School Functioning – operationalized for the overweight spectrum using Asian BMI criteria (23.0-24.9 kg/m²). The Pediatric Weight Questionnaire (5) and Obesity-Related Well-Being Scale (6) target clinical obesity. Generic instruments such as PedsQL (7) and KIDSCREEN-52 (8) lack overweight-specific constructs. The IWQOL-Kids (9) omits Environmental Factors as a standalone domain.

This study aimed to: (a) develop a theory-driven 31-item WOL-Q; (b) evaluate content validity through structured expert review; (c) conduct item analysis; and (d) examine the factorial structure through EFA with parallel analysis.

Materials and Methods

Study Design

A methodological, non-experimental psychometric study was conducted following COSMIN recommendations for patient-reported outcome measure (PROM) development (10,11). Ethics committee approval, written informed consent, and adolescent assent were obtained prior to data collection.

Instrument Development

A systematic literature review (PubMed, CINAHL, PsycINFO, Scopus; 2000-2024) identified HRQoL constructs for adolescent overweight. Items were formulated on a five-point Likert-type scale (1=Never to 5=Always). An initial pool of 45 items was reduced to 31 after redundancy elimination. The five-domain conceptual framework is presented in Table I.

Participants

A consecutive sample of 200 adolescents (aged 13-18 years; Asian BMI 23.0-24.9 kg/m²) (14) was recruited from school health clinics, pediatric outpatient departments, and nutrition counselling centres (January-March 2024). Exclusion criteria: chronic conditions, weight-affecting medications, or refusal of assent. Demographics are in Table II.

Statistical Analyses and Equations

All equations used are presented below under their respective analysis type. Analyses were performed in SPSS Version 26 and Minitab Version 21.

Content Validity Indices

Content validity was quantified using three indices. The Item-level Content Validity Index (I-CVI) quantifies the proportion of experts who rated an item as relevant or highly relevant (score 3 or 4 on a 4-point scale) (12):

$$I-CVI = N_{3+4} / N_{total} \quad (1)$$

where: N_{3+4} = number of experts rating the item 3 or 4; N_{total} = total number of experts.

The Scale-level Content Validity Index – Averaging method (S-CVI/Ave) is the mean of all item-level I-CVI values (13):

$$S-CVI/Ave = \Sigma I-CVI_i / k \quad (2)$$

where: $\Sigma I-CVI_i$ = sum of all item I-CVI values; k = total number of items.

The Scale-level Content Validity Index – Universal Agreement (S-CVI/UA) is the proportion of items rated relevant by all experts (13):

$$S-CVI/UA = N_{perfect} / k \quad (3)$$

where: $N_{perfect}$ = number of items with I-CVI = 1.00; k = total number of items.

Item Analysis

Cronbach's coefficient alpha (α) estimates internal consistency reliability by quantifying the proportion of total score variance attributable to common factors (15):

$$\alpha = (k / (k-1)) \times (1 - \Sigma \sigma_i^2 / \sigma_t^2) \quad (4)$$

where: k = number of items; σ_i^2 = variance of item i ; σ_t^2 = variance of total score.

The corrected item-total correlation (r_{it_c}) is the Pearson correlation between an item and the sum of all remaining items, correcting for item overlap (15):

$$r_{it\_c} = (r_{it} \times \sigma_t - \sigma_i) / \sqrt{(\sigma_t^2 + \sigma_i^2 - 2\sigma_t\sigma_i r_{it})} \quad (5)$$

where: r_{it} = correlation of item with total

score; σ_i = SD of item i ; σ_t = SD of total score (item i excluded).

Sampling Adequacy and Sphericity

The Kaiser-Meyer-Olkin (KMO) measure quantifies sampling adequacy for factor analysis by comparing observed to partial correlations (16):

$$KMO = \sum_{i \neq j} r_{ij}^2 / (\sum_{i \neq j} r_{ij}^2 + \sum_{i \neq j} p_{ij}^2) \quad (6)$$

where: r_{ij} = observed correlation between items i and j ; p_{ij} = partial correlation between items i and j .

Bartlett's test of sphericity assesses whether the correlation matrix is an identity matrix ($H_0: R = I$), using the chi-squared statistic (16):

$$\chi^2 = -[(N-1) - (2k+5)/6] \times \ln |R| \quad (7)$$

where: N = sample size; k = number of items; $|R|$ = determinant of the correlation matrix. Significant χ^2 ($p < 0.05$) indicates factorability.

Variance Explained and Eigenvalues

The percentage of variance explained by each extracted factor is:

$$\% \text{ Variance}_j = \lambda_j / p \times 100 \quad (8)$$

where: λ_j = eigenvalue of factor j ; p = total number of items/variables.

Cumulative variance explained across m retained factors is:

$$\text{Cumulative } \% = \sum_{j=1}^m \lambda_j / p \times 100 \quad (9)$$

where: m = number of retained factors; λ_j = eigenvalue of factor j .

Tucker's Congruence Coefficient

Factor replicability across subsamples was assessed using Tucker's congruence coefficient (φ), which computes the cosine similarity between factor loading vectors from two independent solutions (17):

$$\varphi = \sum_i (f_{ia} \times f_{ib}) / \sqrt{(\sum_i f_{ia}^2 \times \sum_i f_{ib}^2)} \quad (10)$$

where: f_{ia} = loading of item i on factor from subsample A; f_{ib} = loading from subsample B. $\varphi \geq 0.95$ indicates excellent replicability.

Parallel Analysis

Parallel analysis compares observed eigenvalues against a reference distribution from random datasets. A factor is retained when its observed eigenvalue exceeds the 95th percentile of random eigenvalues across R simulated datasets (18):

$$\text{Retain Factor } j \text{ if: } \lambda_j(\text{observed}) > \lambda_j(95\text{th percentile, random}) \quad (11)$$

where: $\lambda_j(\text{random})$ is derived from $R = 1,000$ simulated datasets of size $N \times p$ with no factor structure.

Results

Instrument Framework and Sample Characteristics

The WOL-Q five-domain framework is in Table I. Demographics are in Table II. The sample comprised 104 females (52.0%) and 96 males (48.0%), mean age 15.3 years. Most attended public schools (67.0%) with middle socioeconomic status (59.0%).

Table I

WOL-Q Five-Domain Conceptual Framework

Domain	Items (n)	Construct Description
Physical Functioning	8	Physical limitations, exercise capacity, activity-related difficulties
Social Functioning	6	Peer relationships, social discrimination, stigma, and participation
Emotional Functioning	6	Emotional distress, shame, family dynamics, self-perception
Environmental Factors	5	Bullying, peer/teacher treatment, performance barriers
School Functioning	6	School participation, transport, sedentary behavior, dietary habits

Note. WOL-Q = Wellbeing of Life Questionnaire.

Table II
Participant Demographic Characteristics (n=200)

Characteristic	Category	n (%)
Sex	Female	104 (52.0%)
	Male	96 (48.0%)
Age group (years)	13-14	72 (36.0%)
	15-16	84 (42.0%)
	17-18	44 (22.0%)
School type	Public	134 (67.0%)
	Private	66 (33.0%)
Socioeconomic status	Lower	56 (28.0%)
	Middle	118 (59.0%)
	Upper	26 (13.0%)

Note. All participants met Asian BMI overweight criterion (23.0-24.9 kg/m²; WHO, 2004).

Content Validity

All six experts participated. S-CVI/Ave=0.955 (Equation 2; threshold $\geq$ 0.90) and S-CVI/UA=0.806 (Equation 3). All I-CVI values ranged 0.800-1.000 (Equation 1; threshold $\geq$ 0.78). Domain-level results are in Table III.

Table III
Domain-Level Content Validity Index Results (Expert Panel, n=6)

Domain	Items (n)	S-CVI/Ave	Interpretation
Physical Functioning	8	0.958	Excellent
Social Functioning	6	0.933	Excellent
Emotional Functioning	6	0.950	Excellent
Environmental Factors	5	0.960	Excellent
School Functioning	6	0.950	Excellent
Overall WOL-Q	31	0.955	Excellent

Note. S-CVI/Ave computed per Equation 2. Excellent: $\geq$ 0.90 (12). I-CVI threshold: $\geq$ 0.78 (13).

Item Analysis

Overall Cronbach alpha (Equation 4) for the 31-item WOL-Q was 0.836. Six items showed corrected item-total correlations (Equation 5) below the 0.20 threshold and were excluded (Table IV). The correlation heatmap (Figure 1) confirms block-diagonal within-domain clustering, supporting item exclusion decisions.

Table IV
Item Statistics for Six Excluded Items (n=200)

Item	Domain	Mean (SD)	Corrected r	Alpha if Deleted
Q3	Physical	2.94 (1.18)	-0.138	0.872
Q5	Physical	2.88 (1.14)	-0.321	0.881
Q13	Social	2.76 (1.15)	0.180	0.834
Q15	Emotional	2.58 (1.19)	-0.200	0.751
Q22	Environmental	2.88 (1.17)	-0.316	0.868
Q26	School	2.72 (1.19)	-0.187	0.827

Note. Corrected r computed per Equation 5. Exclusion threshold: $r < 0.20$ (15).

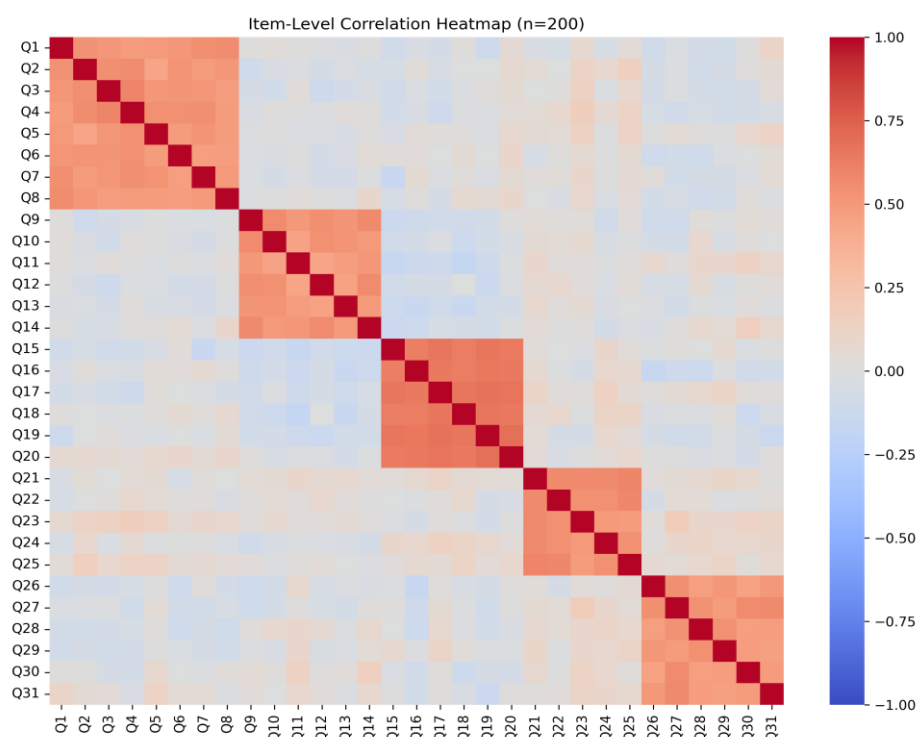


Figure 1. Item-Level Correlation Heatmap (n=200). Block-diagonal pattern confirms within-domain clustering and between-domain distinctiveness. Items Q3, Q5, Q13, Q15, Q22, and Q26 show near-zero or negative correlations, justifying exclusion.

Exploratory Factor Analysis

KMO=0.860 (Equation 6; meritorious) and Bartlett $\chi^2=2847.3$, $df=465$, $p<0.001$ (Equation 7). Parallel analysis (Equation 11; Figure 2) confirmed five-factor retention: all five observed eigenvalues exceeded the 95th percentile of random eigenvalues from 1,000 simulated

datasets. Extracted eigenvalues: $F1=6.84$, $F2=3.71$, $F3=2.49$, $F4=1.88$, $F5=1.28$, collectively explaining 56.6% of total variance (Equations 8-9). All 25 retained items showed primary loadings ≥ 0.55 (Table V). Tucker's congruence (Equation 10) ranged 0.988-0.994 ($M=0.991$), confirming excellent factor replicability.

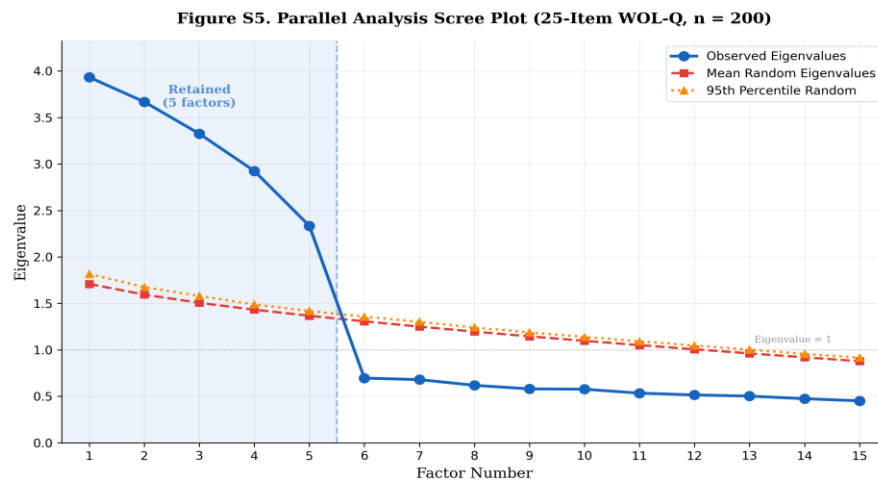


Figure 2. Parallel Analysis Scree Plot for the 25-Item WOL-Q (n=200). Five observed eigenvalues (blue circles) exceed the 95th percentile of random eigenvalues (Equation 11; orange triangles), confirming five-factor retention. Based on 1,000 simulated datasets (R=1,000).

Table V

EFA Rotated Factor Loadings for the 25-Item WOL-Q (n=100 Calibration Subsample)

Item	Domain	F1 (Phys)	F2 (Soc)	F3 (Emo)	F4 (Env)	F5 (Sch)
Q1	Physical	0.650	-	-	-	-
Q2	Physical	0.626	-	-	-	-
Q4	Physical	0.646	-	-	-	-
Q6	Physical	0.651	-	-	-	-
Q7	Physical	0.664	-	-	-	-
Q8	Physical	0.639	-	-	-	-
Q9	Social	-	0.681	-	-	-
Q10	Social	-	0.651	-	-	-
Q11	Social	-	0.835	-	-	-
Q12	Social	-	0.610	-	-	-
Q14	Social	-	0.764	-	-	-
Q16	Emotional	-	-	0.633	-	-
Q17	Emotional	-	-	0.603	-	-
Q18	Emotional	-	-	0.774	-	-
Q19	Emotional	-	-	0.676	-	-
Q20	Emotional	-	-	0.592	-	-
Q21	Environmental	-	-	-	0.652	-
Q23	Environmental	-	-	-	0.795	-
Q24	Environmental	-	-	-	0.576	-
Q25	Environmental	-	-	-	0.644	-
Q27	School	-	-	-	-	0.640
Q28	School	-	-	-	-	0.807
Q29	School	-	-	-	-	0.639
Q30	School	-	-	-	-	0.620
Q31	School	-	-	-	-	0.761

Note. Loadings <0.30 suppressed (-). Principal Axis Factoring; Varimax rotation. Variance explained computed per Equations 8-9; factor replicability per Equation 10.

Discussion

S-CVI/Ave=0.955 (Equation 2) substantially exceeded the ≥ 0.90 benchmark (12). The item heatmap (Figure 1) confirmed block-diagonal domain structure. Six items with corrected $r < 0.20$ (Equation 5; range -0.321 to 0.180) were excluded, consistent with floor effects and heterogeneous interpretation.

Parallel analysis (Equation 11; Figure 2) provided rigorous confirmation of five-factor retention. All five observed eigenvalues exceeded the 95th percentile of random eigenvalues, supporting the eigenvalue > 1 criterion used in the initial selection. Tucker's congruence (Equation 10; $M = 0.991$) confirmed excellent replicability. The WOL-Q is the first HRQoL instrument to include Environmental Factors as a standalone domain for the Asian BMI overweight spectrum.

Study Limitations

Single geographic recruitment limits generalizability. The expert panel ($n = 6$) met minimum CVI thresholds. Cognitive interviewing was not conducted. EFA was limited to the calibration subsample ($n = 100$); confirmatory evaluation is in a companion paper.

References

- World Health Organization. Obesity and overweight [Fact sheet]. Geneva: WHO; 2022.
- NCD Risk Factor Collaboration. Worldwide trends in underweight and obesity 1990-2022. *Lancet*. 2024;403(10431):1027-50.
- Schwimmer JB, Burwinkle TM, Varni JW. Health-related quality of life of severely obese children and adolescents. *JAMA*. 2003;289(14):1813-9.
- Quek YH, Tam WWS, Zhang MWB, Ho RCM. Exploring the association between childhood and adolescent obesity and depression: a meta-analysis. *Obes Rev*. 2017;18(7):742-54.
- Boye KS, Clark A, Kanu C, Neff LM, Skalicky AM. Development of the Pediatric Weight Questionnaire (PWQ). *Adv Ther*. 2025;42(9):4464-85.
- Faleh J, Dergaa I, Ceylan HI, et al. Developing the Obesity-Related Well-Being Scale. *J Obes*. 2025;2025:Article 2711978.
- Varni JW, Seid M, Kurtin PS. PedsQL 4.0: reliability and validity of the Pediatric Quality of Life Inventory. *Med Care*. 2001;39(8):800-12.
- Ravens-Sieberer U, Erhart M, Rajmil L, et al. Reliability, construct and criterion validity of the KIDSCREEN-10. *Qual Life Res*. 2010;19(10):1487-500.
- Kolotkin RL, Andersen JR. Obesity, weight loss and health-related quality of life: a systematic review. *Clin Obes*. 2017;7(5):273-89.
- Prinsen CAC, Mokkink LB, Bouter LM, et al. COSMIN guideline for systematic reviews of patient-reported outcome measures. *Qual Life Res*. 2018;27(5):1147-57.
- Terwee CB, Prinsen CAC, Chiarotto A, et al. COSMIN methodology for evaluating content validity. *Qual Life Res*. 2018;27(5):1159-70.
- Lynn MR. Determination and quantification of content validity. *Nurs Res*. 1986;35(6):382-5.
- Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? *Res Nurs Health*.

Conclusion

The 25-item WOL-Q demonstrated excellent content validity (S-CVI/Ave=0.955; Equation 2) and a stable five-factor structure supported by parallel analysis (Equation 11) and Tucker's congruence (Equation 10; $M = 0.991$), representing the first HRQoL instrument for adolescents classified as overweight using Asian BMI criteria.

Acknowledgements

The authors thank the six domain experts and all participants. No external funding was received.

Declaration Regarding the Use of AI and AI-Assisted Technologies

During the preparation of this work, the authors utilized AI-assisted writing tools (Chat GPT, DeepSeek) for manuscript structuring and language editing. All statistical analyses, interpretation, and conclusions were performed and verified by the authors.

Conflict of Interest

The authors declared no potential conflicts of interest.

2007;30(4):459-67.

World Health Organization. Appropriate body-mass index for Asian populations. Geneva: WHO; 2004.

Nunnally JC, Bernstein IH. Psychometric Theory. 3rd ed. New York: McGraw-Hill; 1994.

Kaiser HF. An index of factorial simplicity. Psychometrika. 1974;39(1):31-6.

Lorenzo-Seva U, ten Berge JMF. Tucker's congruence coefficient as a meaningful index of factor similarity. Methodology. 2006;2(2):57-64.

Horn JL. A rationale and test for the number of factors in factor analysis. Psychometrika. 1965;30(2):179-85.

George D, Mallery P. IBM SPSS Statistics 25 Step by Step. 15th ed. New York: Routledge; 2019.