Impact of Weight on Quality-of-Life Questionnaire-Lite, Mexican Version. Reliability and Validity Evidence

Cuestionario Breve de Impacto del Peso en la Calidad de Vida, versión mexicana

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The short form of the Impact of Weight on Quality of Life (IWQOL) is a 31-item self-report, that assesses the influence of weight on life quality in five areas: physical function, self-esteem, sexual life, public distress, and work. The objective of this study was to assess reliability and validity of the instrument in Mexican adults with weight ranging from normal to obese. Participants were 211 women and 98 men recruited from a public university. During a pre-scheduled appointment their weight and high were measured (average BMI = 26.13). Same participants were e-mailed the IWQOL-Lite, and the collateral measure questionnaires: DASS-21, TFEQ-R18, and a Physical Activity item. Internal consistency of the IWQOL-Lite total scale and subscales ranged from α = .82 to .95. The five-factor structure was confirmed with the number of items reduced to 26 via confirmatory factor analysis. Evidence of the convergent validity was obtained via correlations with the above-mentioned collateral measures. Our findings suggest that IWQOL-Lite (26 items) is a psychometrically valid measure that discriminates between different BMI groups and can be used to evaluate the impact of weight in the population of Mexican adults.
Keywords: IWQOL-Lite questionnaire, health-related quality-of-life, obesity, psychometrics.

La forma breve del Cuestionario de Impacto del Peso en la Calidad de Vida (IWQOL-Lite) es un autoinforme de 31 ítems, que evalúa el impacto del peso en la calidad de vida en cinco áreas: estado físico, autoestima, vida sexual, ansiedad en público y trabajo. El objetivo fue evaluar la confiabilidad y validez del instrumento en adultos mexicanos, con un rango de peso normal a obeso. Los participantes fueron 211 mujeres y 98 hombres, reclutados en una universidad pública. Durante una cita programada, se les midió su peso y estatura (IMC promedio = 26,13). A los participantes se envió por correo el IWQOL-Lite e instrumentos de medidas colaterales: DASS-21, TFEQ-R18 y un ítem de actividad física. La consistencia interna del IWQOL-Lite y subescalas se encontraron en el rango de α = ,82 a ,95. La estructura de cinco factores se confirmó con 26 ítems, mediante análisis factorial confirmatorio. También se obtuvieron evidencias de validez convergente a través de correlaciones con las medidas colaterales mencionadas. Nuestros hallazgos sugieren que el IWQOL-Lite es una medida psicométricamente válida, que discrimina entre diferentes grupos de IMC, y puede usarse para evaluar el impacto del peso en adultos mexicanos.
Palabras clave: cuestionario IWQOL-Lite, calidad de vida relacionada con la salud, obesidad, psicometría.

Introduction

Obesity has become the leading public health concern in Mexico, with its prevalence reaching 36%, and combined with overweight 75% (Secretaría de Salud, 2018). It is associated not only with numerous diseases (World Health Organization [WHO], 2020), but also with deterioration in overall quality of life, encompassing physical and social functioning, and psychological wellbeing (Rand et al., 2017). Considering the increasing rates of obesity in Mexico, it is important to assess its impact on quality of life in a time-effective manner. Kolotkin, Head, Hamilton and Tse Chiukit (1995) developed an instrument that measures the influence of excess body weight on several areas of life: the Impact of Weight on Quality of Life (IWQOL). Although the long version of the IWQOL was validated with a Mexican sample, the shorter version that reduces burden of the scale application has not.

The concept of health-related quality of life over the years has moved from saving lives to improving quality of lives, and it is defined as subjective evaluation that individuals hold with regard to their physical, psychological, and social functioning (WHO, 1996). Several instruments have been developed to assess health-related quality of life. These can be divided into instruments that assess general health-related quality of life, e.g., the 36-Item Short Form Health Survey (Albarrán-Sánchez et al., 2021) or WHOQOL-BRIEF (Kalfoss, Reidunsdatter, Klöckner, & Nielsen, 2021), and scales that evaluate quality of life in relation to a specific health problem. Among the latter, the Impact of Weight on Quality of Life (IWQOL) questionnaire (Kolotkin et al., 1995) was the first instrument that focused specifically on the effect of excessive weight on life quality.

To develop the items of the IWQOL (Kolotkin et al., 1995) clinicians who specialize in treatment of obesity catalogued concerns of patients regarding the impact of their excess body weight in different domains. Eight areas were identified: Health, Social/Interpersonal, Work, Mobility, Self-Esteem, Sexual Life, Activities of Daily Living, and Comfort with Food. The instrument included 74 items, that begin with the phrase 'Because of my weight', measured on a 1 (*never true*) to 5 (*always true*) response scale. Higher numbers are indicative of the stronger negative impact of excess body weight on quality of life.

The authors developed the instrument with the following aims in mind: 1) assess reliably and validly the extent to which weight affects quality of life, 2) identify areas of life that excess body weight affects the most, 3) measure the impact of weight loss on quality of life. About the last aim, the intention was to be able to obtain additional information, beyond kilograms lost, regarding the efficacy of the weight loss treatment. Focusing just on BMI does not provide insight into patient perception of their overall health. Hence, the IWQOL multifaceted view of treatment outcome can serve patients, physicians, and psychologists to monitor changes during a patient's weight loss journey, adjust treatment decisions and plan future treatments. To facilitate the scale application, the instrument was revised and shortened to 31 items, resulting in the IWQOL-Lite version (Kolotkin, Crosby, Kosloski, & Williams, 2001). Items were selected applying exploratory factor analysis based on higher factor loadings. The domains were reduced to five: Physical Function, Self-Esteem, Sexual Life, Public Distress, and Work. The IWQOL-Lite internal consistency measured with Cronbach's α was excellent: .96 for the total score, and it ranged from .90 to .94 for the subscales. Interscale correlations ranged from .46 for Sexual Life and Public Distress to .70 for Physical Function and Public Distress. The construct validity was supported by its correlations with collateral measures: at baseline and one-year change correlations. All subscales and the total scale correlated significantly with BMI ($p < .001$) at baseline, with correlations ranging from .34 for Self-Esteem to .68 for Public Distress. Changes in all subscales and the total scale correlated significantly ($p < .01$) with changes in BMI. Four subscales (all except Public Distress) and the total score correlated with changes in the Rosenberg Self-Esteem scale, with the highest correlation for IWQOL-Lite Self-Esteem. All subscales and the total scale correlated significantly also with changes in Beck Depression Inventory and SCL-90-R Global Severity, which encompasses instruments that assess psychological symptoms and psychological distress. The further evidence for the instrument validity was provided via comparing the subscale scores across BMI groups, which were significantly different, with total score and subscale scores increasing

with the increases in BMI, that is, higher BMI was associated with lower quality of life due to excessive weight.

The IWQOL questionnaire was validated in Latin America, the long version with a Mexican sample (Bolado-García, López-Alvarenga, Gonzalez-Barranco, & Comuzzie, 2008) and a short version with a Colombian sample (Acevedo & Cepeda, 2009). Although the studies provided evidence for the scale validity and reliability, validation did not include confirmatory factor analysis, and the samples included predominantly participants with BMI > 30. In the study realized by Bolado-García et al. (2008), reliability was assessed via test-retest (n = 82, BMI 32.3 ±7.8), internal consistency with Cronbach's α, and sensitivity to detect differences was evaluated: 1) between types of obesity (n = 105, BMI 35.1±9.5), and 2) after treatment for weight loss within groups (n = 40, BMI 39.2 ±7). For the test-retest intraclass correlation coefficient remained between .84 and .97, and Cronbach's α between .92 and .99. The IWQOL allowed to detect differences between groups of different BMIs, with BMI group > 45 presenting the highest negative impact of weight on quality of life. Additionally, participants who lost weight after weight loss treatment experienced improvement in all scales (p < .001), except for Work. Correlation between weight loss and scores of the different subscales ranged from .08 to .57, only correlations for Health and Comfort with Food were significant (p < .05).

In the study realized by Acevedo and Cepeda (2009) internal consistency was estimated with Cronbach's α, and it ranged from .89 to .96 for five subscales (n = 223, BMI 33.3 ±6.0). Reliability was assessed also via test-retest for each subscale, with intraclass correlation coefficient values between .85 and .94. Exploratory factor analysis confirmed the original five-factor structure and the factors resulted associated, with correlations ranging from: .64 to .78. Correlation coefficients for anthropometric measurements (BMI & waist circumference) and the subscales: Physical Functioning, Public Distress obtained values close to -.5. Correlations were negative as the authors presented subscale scores as percentage of quality of life, where higher scores indicated better quality of life. Regarding associations with the physical and mental component of 36-Item Short Form Health Survey (SF-36), the highest correlation was obtained between SF-36 physical component and IWQOL physical functioning (r = .77).

Despite the encouraging psychometric results obtained thus far on the IWQOL-Lite, we believe that obtaining additional evidence for the instrument validity in samples within Latin America, beyond obese population, via additional, advanced statistical methods, would add to strengthening psychometric properties of the instrument.

Objective and hypothesis

The primary objective of this study was to assess reliability and validity of the Mexican IWQOL-Lite version among adults with BMI ranging from normal to obese. For this purpose, the instrument psychometric properties were evaluated via confirmatory factor analysis, taking into consideration reliability indices and evidence for internal convergent and discriminant validity. The following relationships were expected: higher BMI would be associated with lower quality of life due to excess body weight in different areas of life; higher scores for Depression, Anxiety and Stress (DASS-21; Lovibond & Lovibond, 1995) would be associated with more difficulty, especially in Physical Function and Self-Esteem; higher scores for Three Factor Eating Questionnaire (TFEQ-R18; Karlsson, Persson, Sjostrom, & Sullivan, 2000) would be associated with more difficulty in Physical Function and Self-Esteem; and lower levels of physical activity would indicate lower quality of life impacted by weight.

Furthermore, it was anticipated to obtain the evidence for the instrument sensitivity to contrast between the groups of different BMI and sex across the IWQOL-Lite domains. It was hypothesized that women would perceive lower quality of life due to excessive weight based on previous investigation outside Latin America (e.g., Kolotkin & Crosby, 2002), yet this association has not been evaluated by Bolado-García et al. (2008) or Acevedo & Cepeda (2009).

Method

Participants

Participants were recruited as part of the Project 42 study, a longitudinal, multifactorial, interdisciplinary project designed to investigate causes and risk factors of obesity and metabolic disease

using data from academics, workers and students at the Universidad Nacional Autónoma de México. In the current study a subsample of 309 workers and students took part (average age 40 ± 14 years, range 19-79). The subsample was selected considering representation of all three BMI subcategories, that is, normal weight, overweight and obese, and assuring complete responses to the IWQOL and other instruments used for divergent and convergent validity. The study was approved by the Research and Ethics Commissions of the Faculty of Medicine at UNAM. Table 1 includes demographic and anthropometric characteristics of the participants.

Table 1
Demographic and anthropometric characteristics of the participants, n = 309

Variable	Category/range	Percentage/ Mean (SD)
Sex	Women	68%
	Men	32%
Age	Range: 19-79 y.o.	40.67 (13.81)
Civil status	Single	57%
	In a relationship	35%
	Other	8%
Education	Higher	72%
	Secondary	28%
Weight	Range: 44-134 kg	68.57 (13.34)
Height	Range: 138-189 cm	161.76 (8.93)
BMI	Range: 18.5-41.1kg/m2	26.13 (4.14)
	Norm: 18.5-24.9	44%
	Overweight: 25-29.9	38%
	Obese: ≥ 30	18%

Instruments

IWQOL-Lite Measure. The 31 item IWQOL-Lite (Kolotkin et al., 2001) is a health-related self-assessment questionnaire to evaluate impact of weight on quality of life. It comprises five subscales: Physical Function (11 items), Self-esteem (7 items), Sexual Life (4 items), Public Distress (5 items), and Work (4 items). The responses are measured on a 1 (*never true*) to 5 (*always true*) scale. The higher scores are indicative of higher impact of weight on quality of life, meaning more problems due to excesses body weight. Kolotkin et al. (2001) reported the following reliability coefficients (Cronbach's α) in a sample of 1987 individuals (predominantly white = 71%, with average BMI ranging from 27 to 51 depending on the subgroup of the study): physical function .94; self-esteem .93; sexual life .91; public distress .90; and work .90, and for the total scale .96.

The Spanish version was obtained from Villa Guijarro (2017); slight adaptations were applied to accommodate for Mexican Spanish (the applied changes included: item 9 "anquilosamiento" was changed to "entumecimiento"; item 23 "atención superflua" was changed to "falta de atención").

Body Mass Index. To calculate Body Mass Index, defined as weight in kilograms divided by height in square meters, height was measured with a stadiometer to the nearest millimeter, and weight with OMRON HBF-514C scale to the nearest .1 kg without shoes and any outerwear. Norms of WHO were applied to classify participants into BMI categories: < 18.5 for underweight, 18.5-24.9 normal weight, 25-29.9 overweight, and ≥ 30 obese (WHO, 2021). Those with BMI < 18.5 were excluded.

DASS Measure. The Depression, Anxiety and Stress Scales (DASS-21; Lovibond & Lovibond, 1995) measure the severity of the core symptoms of low positive affect (depression), hyperarousal (anxiety), and negative affect (stress). Participants responded to items using a scale ranging from 0 (*never*) to 3 (*almost always*), so the higher scores are indicative of higher levels of depression, anxiety and stress. Spanish version translated and tested among Hispanic adults by Daza, Novy,

Stanley, & Averill (2002) was applied. This version of the scale obtained the following α values: total scale .96; depression .93, anxiety ,86, stress .91. As the scale has not been validated within a Mexican population, Confirmatory Factor Analysis (CFA) was performed with the sample of this study and the number of items was reduced to 15: depression (items: 3, 10, 16, 17, 21), anxiety (items: 4, 7, 8, 11, 15, 19), and stress (items: 1, 6, 12, 18). Internal consistency estimated with Cronbach's α for the total scale was .93 (.88 for depression, .85 anxiety, and .82 stress).

TFEQ-R18 Measure. The Three Factor Eating Questionnaire (TFEQ-R18; Karlsson et al., 2000) is a self-assessment questionnaire to evaluate eating behavior. It comprises three subscales: Uncontrolled Eating (nine items), Emotional Eating (three items), Cognitive Restraint (six items). Uncontrolled eating refers to compulsive overeating; higher scores indicate less control. Emotional eating represents overeating under the influence of negative emotions; higher scores are indicative of consuming more under the influence of emotions. Cognitive restraint refers to controlling food intake to manage body weight; higher scores indicate more control (Karlsson et al., 2000). Seventeen items are measured on a 1 to 4 response scale (responses to items 1 through 13 go from 1 = *definitely false* till 4 = *definitely true*) and the last item is measured on an eight-point numerical rating scale. This last item was later recoded to a four-item scale. The TFEQ was validated with the sample of this study via exploratory and confirmatory factor analysis (Wrzecionkowska & Rivera Aragón, 2021). Cognitive restraint scale was reduced to four items. Confirmatory factor analysis provided evidence of good model fit (Comparative Fit Index .96, Goodness of Fit Index .91, Root Mean Square Error of Approximation .05, and Standardized Root Mean Square Residual .06) meeting or surpassing the cutoff points indicated by Hu & Bentler (1999). Cronbach's α for the total scale was .82 (.84 for uncontrolled eating, .73 emotional eating, and .59 cognitive restraint). Due to low value of α for cognitive restraint, we used only the remaining two subscales.

Physical Activity. Physical activity was measured with a single item "I have been practicing physical activity regularly for years" (Practico actividad física de forma regular desde hace años), with responses ranging from 1 = *totally disagree* to 5 = *totally agree*.

Procedure

During a pre-scheduled appointment, participants of the larger obesity study had their anthropometric measurements taken. Written consent was obtained from every participant, and data discussed here are anonymized. Within couple of months from the appointment, the link to the questionnaires the IWQOL-Lite, DASS-21, TFEQ-R18, and one item regarding physical activity practice were sent to the same participants via email.

Statistical analysis

Confirmatory factor analysis was used to test the fit of the five-factor model to the data, with the following fit indices: CMIN/DF, Comparative Fit Index (CFI); Incremental Fit Index (IFI), errors: Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) (Hu & Bentler, 1999). Cronbach's α and ω coefficients were computed to estimate reliability of the scale scores, including coefficients for the subscales and the total score. Evidence for internal convergent validity was obtained estimating Average Variance Extracted (AVE). To obtain evidence of internal discriminant validity correlations between factors and square root of AVE were obtained. Relationships between the IWQOL-Lite domains and BMI, and sex were examined via correlations and two-way ANOVA. Convergent validity was estimated via associations with collateral measures: DASS-21, TFEQ-R18, and one item regarding Physical Activity. Data were analyzed with SPSS 25 and AMOS 23.

Results

Confirmatory Factor Analysis

Confirmatory factor analysis with Maximum Likelihood estimation was applied to evaluate model fit with five factors. Simulation studies have shown that for Likert scales with ≥ 5 response options, factor correlations and model fit are assessed well with Maximum Likelihood (Rhemtulla et al., 2012). Some of the model fit indices did not meet the established criteria (see table 2). A better model fit was obtained removing items 11, 18, 23,

27, 29. Item 11 "Worried about health" was eliminated due to low factor load .34 (loads of other items oscillated between: .52 and .94). Item 23 "Experience ridicule" and item 27 "Experience discrimination" were removed due to high standardized residual covariances with multiple other items, indicative of high error. Item 18 "Embarrassed in public" and 29 "Less productive than could be" were removed due to associations of their error with errors of multiple items. Following the indications from modification indices for the

model fit optimization, we associated some errors (See figure 1 for the factor structure of the IWQOL-Lite with 26 items and the errors associated).

Obtained model indices indicated acceptable fit, with Chi-square divided by degrees of freedom, IFI and SRMR meeting the good fit criteria, yet with CFI slightly below and RMSEA above the cutoff points (see table 2). Further analysis was conducted with 26 items maintaining the original number of items only for Sexual Life subscale.
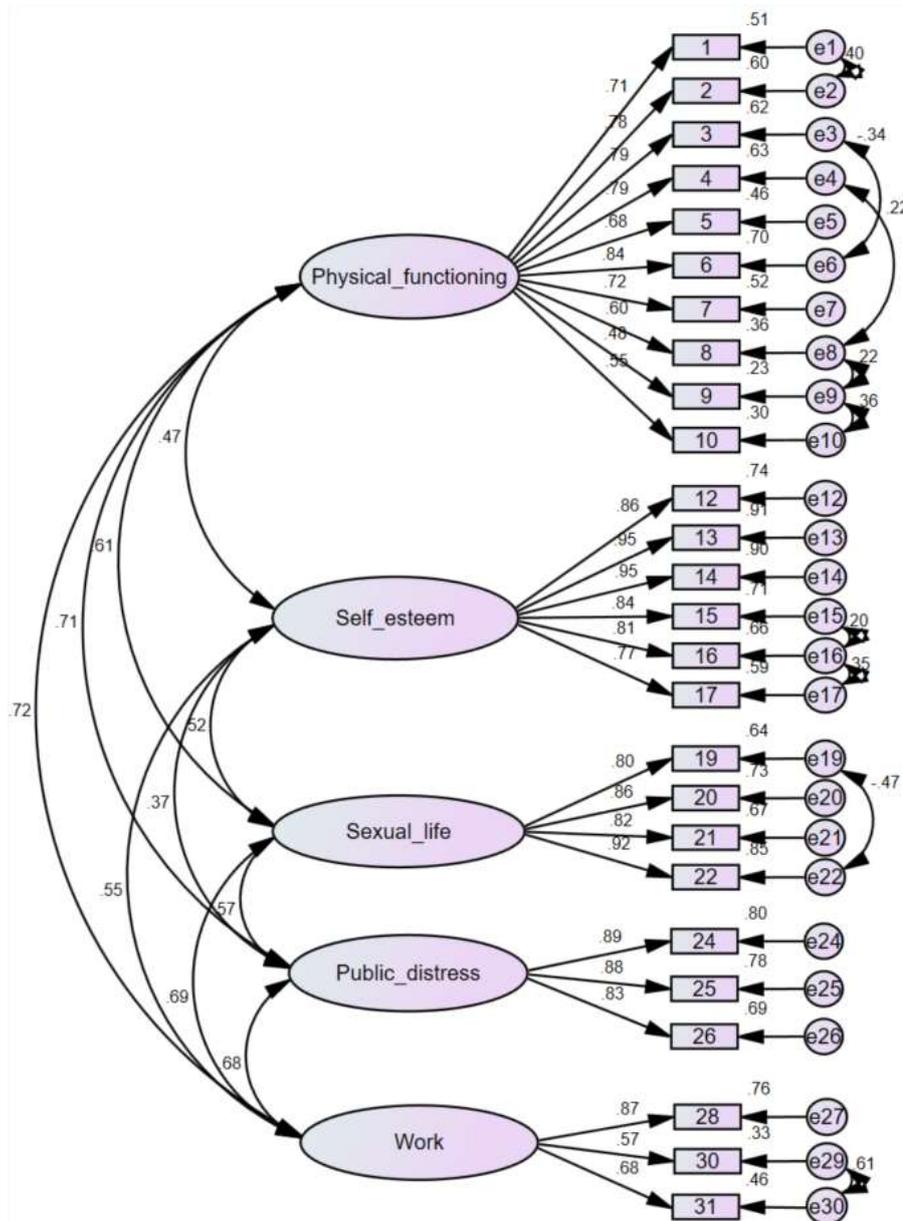

Figure 1. The five-factor model with standardized factor loadings in Mexican adults, n=309.

Table 2
Fit indices for two measurement models examined via CFA, n=309.

Fit indices	Original model 31 items	Model w/o 11,18,23,27,29 26 items	Benchmarks*
Chi-square/df	4.59	2.76	< 3
CFI. Comparative Fit Index	0.81	0.92	> .95
IFI. Incremental Fit Index	0.81	0.92	> .90
RMSEA. Root Mean Square of Approximation	0.11	0.08	< .06
SRMR. Standardized Root Mean Square Residual	0.09	0.06	< .08

Note. *Cited from Hu & Bentler, 1999.

Internal consistency

Cronbach's α for the subscales ranged from .82 for Work to .93 for Self Esteem, and .93 for the total scale, indicating good to excellent internal consistency. Omega values were close to those of Cronbach's α, with exception for Work subscale, which had a lower value of omega (see table 3). Cronbach's α obtained for the scale with 26 items were similar, and in some cases higher, than those obtained for the scale with 31 items.

Inter-factor correlations and evidence for internal convergent and discriminant validity

All subscales were positively and significantly associated with each other ($p < .01$), correlations ranged from .37 to .60. Correlations between individual scales and the total score suggested that scales contribute comparably to the total score (see table 3).

Average Variance Extracted (AVE), evidence for internal convergent validity, exceeded the cutoff point of .5 for four subscales; only Physical Function subscale resulted with the value slightly below the cutoff. The square root from AVE for each subscale resulted greater than the correlations for the corresponding subscales, providing evidence for internal discriminant validity.

Table 3
Internal consistency and internal validity for the IWQOL-Lite, n= 309.

IWQOL-Lite subscales	Original scale		Scale w/o items: 11, 18, 23, 27, 29								
							Inter-factor correlations				
	Item	α	Item	α	ω	AVE	Physical Function	Self-esteem	Sexual life	Public distress	Work
Physical function	11	.87	10	.89	.90	.49	.70	.47	.56	.60	.53
Self-esteem	7	.95	6	.95	.94	.75		.87	.51	.37	.44
Sexual life	4	.90	4	.90	.91	.72			.85	.54	.58
Public distress	5	.86	3	.90	.90	.76				.87	.54
Work	4	.82	3	.82	.76	.52					.72
Total	31	.95	26	.94	.95	.67					

Note. The elements on the diagonal, on the grey background, represent the square root of the average variance extracted (AVE); $p < .001$.

Evidence for convergent and divergent validity

Correlations were calculated between each subscale of the IWQOL-Lite and BMI, the subscales of the DASS-21 (Depression, Anxiety, and Stress), two subscales of the TFEQ-R18, and the Physical Activity item. The results are shown in table 4.

As expected, all the IWQOL-Lite subscales were associated significantly with BMI. Physical Function correlation with BMI was the highest (.50), meaning that the higher levels of BMI were associated with the higher IWQOL scores in physical functioning.

Each of the DASS-21 subscales correlated significantly with all the subscales of the IWQOL, i.e., the higher IWQOL scores in all five areas were associated with higher levels of depression, anxiety, and stress. Associations were the highest with the IWQOL Self-Esteem and the lowest with Public Distress scale.

In relation to the TFEQ, for the subscale Uncontrolled Eating, the higher IWQOL values for Physical Function, Self-Esteem, Sexual Life, and Work were associated significantly with the higher

levels of Uncontrolled Eating. The Emotional Eating subscale correlated significantly with all the subscales of the IWQOL-Lite. The higher scores of Emotional Eating were associated with the higher values of IWQOL in all five areas of the scale, with the strongest association for Self-esteem. The lower IWQOL scores were associated with the higher levels of physical activity reported, expressed via more agreement with the statement "I have been practicing physical activity regularly for years."

Table 4

Correlation indices between IWQOL-Lite subscales & collateral measures: BMI, DASS, TFEQ, Physical Activity

IWQOL-Lite	BMI	DASS			TFEQ		Physical Activity
		Depression	Anxiety	Stress	Uncontrolled Eating	Emotional Eating	
Physical function	0.50	0.21	0.37	0.27	0.26	0.30	-0.20
Self-esteem	0.28	0.43	0.45	0.46	0.35	0.35	-0.30
Sexual life	0.38	0.26	0.22	0.19	0.17	0.17	-0.20
Public distress	0.45	0.16	0.18	0.13*	ns	0.17	ns
Work	0.26	0.34	0.29	0.26	0.26	0.20	-0.17
Total	0.47	0.38	0.45	0.40	0.34	0.35	-0.29

Note. $p < 0.01$; *$p < 0.05$; ns = not significant; BMI: Body Mass Index; DASS-21: Depression, Anxiety, Stress. TFEQ-R18: Three Factor Eating Questionnaire.

Contrasted groups validity evidence

We conducted two-way ANOVA accounting for three BMI groups and sex (women and men). The interaction effect between BMI and sex was not significant for any of the subscales, nor for the total scale. However, the main effects for BMI and for sex were significant for all subscales and for the total scale.

The highest IWQOL scores were associated with the highest BMI, and the lowest IWQOL scores with the lowest BMI. Post hoc results using the Bonferoni test indicated that the differences were significant between normal and obese BMI groups for four subscales ($p < .001$), except for Work ($p = .011$); between normal and overweight BMI groups for Physical Function ($p < .001$) and Self-Esteem ($p = .008$), and between overweight and obese BMI group for Public Distress, Sexual Life, and Physical Function ($p < .001$) (figure 2). The main effect for gender was significant for all subscales and the total scale. Overall women reported higher IWQOL levels than males (figure 3).

Discussion

The results of this study provide evidence that the IWQOL-Lite is a valid instrument for measuring weight-related quality of life in Mexican adults with weight ranging from normal to obese. The data obtained suggest that the scale presents acceptable psychometric properties. Confirmatory factor analysis corroborated five-factor structure, with the number of items reduced to 26: Physical Function (10 items), Self-esteem (6 items), Sexual Life (4 items), Public Distress (3 items), and Work (3 items). As two of fit indices did not meet the cutoff points proposed by Hu and Bentler (1999), further studies are recommended to optimize verbiage of the items for Mexico.

Regarding the removed items, item 11 "Worried about health" showed some issues also in the study by Acevedo and Cepeda (2009), with the lowest factorial weight in its subscale. The authors proposed that a change in translation could help, from: "Me preocupa mi salud" to "Estoy preocupado/a por mi salud". Although we used the recommended translation, the item proved problematic and hence was removed. In the study by Kolotkin et al. (2001) on the development and validation of the IWQO-Lite, this item obtained the lowest correlation item-to-subscale (.44), and item-to-scale (.48). In the longer version of the IWQOL, this item belonged to Health subscale. It is one of the four items that does not follow the same phrasing, that is, it does not begin with "Because of my weight". Moreover, this item is more general in meaning compared to other items that focus on a specific body part affected by weight (e.g., joints, or legs), or a specific situation in Physical Function (using stairs, dressing, crossing legs).
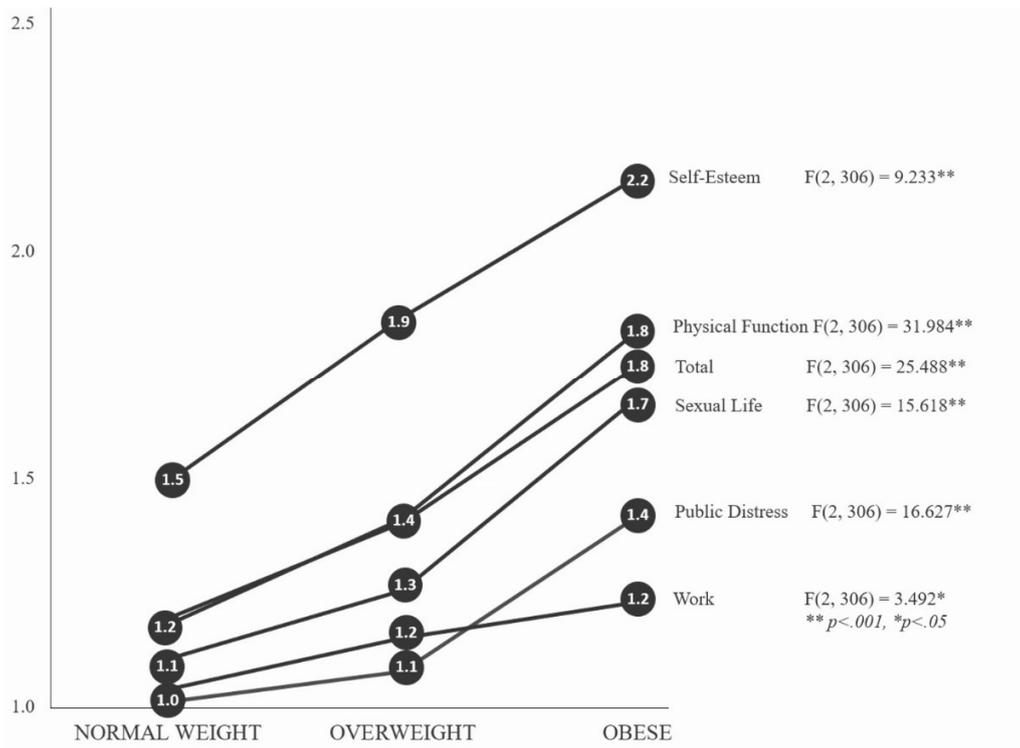
Figure 2. Differences for the IWQOL-Lite subscales by BMI.
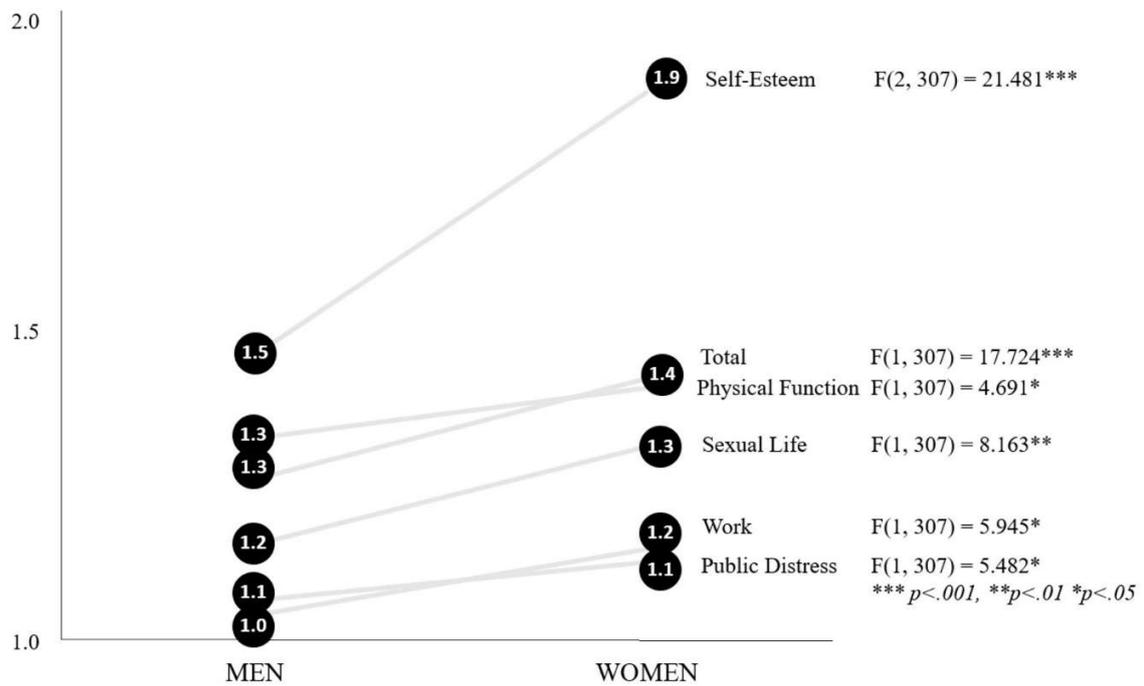
Figure 3. Differences for the IWQOL-Lite subscales by sex.

We removed also item 18 "Embarrassed in public", from Self-esteem scale. Considering its meaning, it slightly differs from the other items of the subscale in its inclusion of "public-spaces" which might relate to being evaluated by others, while other items of the scale focus on self-evaluation. Although it could be argued that item 16 "Afraid of rejection" follows the same logic as item 18. Different character of these two items can be explained considering that both originated from Social/Interpersonal subscale. Future studies in Spanish could investigate alternative translations to *Debido a mi peso me siento avergonzado/a de ser visto/a en lugares públicos*.

Other removed items included 23 "Experience ridicule" and 27 "Experience discrimination" from Public Distress subscale. Originally these items belonged to Social/Interpersonal subscale of the IWQOL. In some earlier studies (e.g., Acevedo & Cepeda, 2009; Kolotkin et al., 2001), these items obtained the lowest item-to-subscale correlations on the IWQOL-Lite. Their content refers to negative reactions from others, while the remaining three items of the subscale (originally from the Activities of Daily Living subscale) refer to the evaluation of respondents about their own volume and weight, and how these impact fitting in public spaces. This, together with the evidence of high standardized residual covariances with multiple other items, indicates two different latent variables within the Public Distress subscale on IWQOL-Lite.

Item 29, "Less productive than could be" from Work scale, was also eliminated. Considering the semantics of the item, it was more speculative (the phrase "than could be") than other items, which might involve different processing of the item. Other semantic consideration could be the more general meaning of the item, not necessarily limited to work, while items 30 and 31 include more specific reference to work. Although it could be argued that item 28 is also more general in meaning ("Trouble accomplishing things"). It is recommended to work with alternative translations to obtain further information on the item (translation used in this study: "Debido a mi peso soy menos productivo/a de lo que podría ser").

The results of this study indicate good reliability of the IWQOL-Lite with 26 items, based on Cronbach's α coefficient for subscales between .82-.95, and .94 for the total scale; and ω coefficient between .76 and .95, although α values were slightly lower than those obtained by Kolotkin et al. (2001). In the Colombian sample the coefficients ranged from .89 for Work to .96 for Self-Esteem, Physical Function and Sexual Life. In the present study, α for Physical Functioning and Public Distress actually improved after removing items 11, 23 and 27, while removal of items 18 and 29 did not affect α of the corresponding subscales. In this study, Work had least strong psychometric qualities, among the five subscales. Lower α value for this subscale compared to α values for other subscales, is consistent with previous studies. Kolotkin and Crosby (2002), and Acevedo and Cepeda (2009) identified Work as the subscale with the lowest reliability based on test-retest results.

We found evidence for convergent validity obtaining correlations between the IWQOL-Lite subscales and BMI, in line with the results from previous studies (Acevedo & Cepeda, 2009; Bolado-García et al. 2008; Kolotkin et al., 2019; Mason et al., 2017). As expected, participants with the higher BMI indicated higher IWQOL levels. Other evidence confirming internal validity came from the correlations of the subscales with the collateral concepts: Depression, Anxiety, Stress, Uncontrolled Eating, Emotional Eating, and Physical Activity.

Correlations between the IWQOL-Lite and the DASS-21 were consistent with the findings obtained in earlier studies (e.g., Andrés, Saldaña, Mesa, & Lecube, 2012). In a sample of 109 obese adult patients (BMI ≥ 35) from Barcelona, they found medium size correlation between the total scores of the DASS scale and the total IWQOL-Lite (.57, $p < .001$); the correlations with subscales were not reported.

Comfort with Food was one of the original subscales of the IWQOL, so we expected that concepts related to food intake would correlate with the IWQOL-Lite subscales. As expected, Emotional Eating -overeating under negative emotions- was correlated with all the IWQOL subscales, with the highest correlation for Self-esteem subscale. Higher body esteem has been shown to correlate negatively with emotional eating (e.g., Carbonneaua et al., 2020). Uncontrolled Eating —the excessive food intake in response to signals from the

environment, characterized by a subjective increase in appetite and absence of self-control in eating— also obtained the strongest correlation value with Self-Esteem subscale. Some studies associate self-esteem with adopting healthy living habits, such as an adequate eating style (e.g., Pérez-Fuentes, Molero Jurado, Simón Márquez, & Gázquez Linares, 2019).

For Physical Activity, it was the IWQOL-Lite Self-esteem subscale that obtained the highest correlation value with the item. Earlier studies suggest positive association between physical activity and self-esteem (Moral-García, Orgaz García, López García, Amatria Jiménez, & Maneiro Dios, 2018). When comparing BMI groups, IWQOL-Lite distinguished between the normal and obese BMI groups, yet the difference between normal and overweight groups was significant only for Self-esteem, Physical Function and the total scale. Lack of significant differences between normal weight and overweight groups was reported, across five subscales, by Kolotkin et al. (2001). We can hypothesize that there is a little difference perceived regarding quality of life between those with normal and overweight BMI, while the difference becomes notable at the obese BMI, yet further studies are required to corroborate it.

When exploring gender differences, there was a general tendency for women to report higher levels of IWQOL vs. men across all subscales, with the difference being most prominent for Self-Esteem. This association has been reported not only for the IWQOL by Kolotkin and Crosby (2002) and Mason et al. (2017), but also in studies with other instruments like the Brief Stigmatizing Situations Inventory, a ten-item self-report that assesses lifetime experiences of weight-related stigma (Sattler, Deane, Tapsell, & Kelly, 2018). In Mexico, women face and internalize discrimination in different domains of life (Organization for Economic Co-operation and Development, 2017), so perceiving stronger impact of weight on quality of life adds more complexity to the structural problem of gender inequality.

Looking at descriptive data, the quality-of-life domain most impacted by weight was Self-esteem, then Physical Function, and the least impacted were Work and Public Distress. The means for all the subscales were below theoretical mean across BMI groups, indicating that even obese respondents did not perceive severe impact of body weight

on their quality of life. This could imply adaptation to excess body weight. In Mexico, predominant majority is either overweight or obese (75%); being surrounded by predominantly more robust body shapes may contribute not only to normalization of that figure (Muttarak, 2018), but also to normalization of how excessive weight impacts everyday activities. Alternatively, the lower IWQOL means could be explained via coping mechanism of denial, while answering the questionnaire respondents might not want to admit the impact that their weight exercises on their quality of life.

Despite encouraging findings, some limitations of the study need to be considered. Structural equation modeling is not optimal for the non-normally distributed data, however, due to the design of the construct and the IWQOL scale design, some score asymmetry is to be expected. Therefore, robust estimation methods could be tested in future studies, such as weighted least square mean and variance adjusted with bootstrap. Some of the more stringent criteria for the parameters of CFA model were not met (IFI = 90, vs. cutoff .92, RMSEA = .08, vs. cutoff .06), so it is recommended to investigate further optimization of the instrument for the Mexican sample. Although the sample was diverse regarding age, it consisted predominantly of single women with higher education; also, the representation of participants with obesity was lower compared to normal and overweight BMI groups.

On the other hand, the strengths of this study include the use of confirmatory factor analysis, which compares the actual data to a model of how the data should look. CFA was not applied for this instrument in earlier studies in Latin America. This study contributes to broadening the nomological network of constructs associated with the concept of quality of life impacted by weight. It also contributes to broadening the samples that has been studied so far in Mexico with the IWQOL-Lite, via inclusion of those with normal BMI. Considering future research with the IWQOL-Lite, we suggest reporting means rather than sums per subscale for grater comparability and to facilitate data interpretation; as some items might be removed when validating the scale in international contexts, means would still allow comparability.

In the context of predominantly overweight population (obesity included) and growing levels of obesity in Mexico (Secretaría de Salud, 2018),

the IWQOL-Lite Mexican version provides a useful tool for measuring the impact of weight loss interventions on both individual and population level. The instrument allows to assess impact of interventions beyond kilos lost, providing data on more perceptual level, from five domains of life. On an individual level it can help to assess and plan future interventions, informing both patients and clinicians. Also, applying the IWQOL-Lite on a broader sample, and using a longitudinal design could help assess and monitor the impact of nation-wide policies and interventions.

Conclusions

Evidence collected in this study indicates that IWQOL-Lite (26 items) is a psychometrically reliable and valid measure that discriminates between different BMI groups and can be used to evaluate the impact of weight in the population of Mexican adults, with BMI ranging from normal to obese. Positive associations of the IWQOL-Lite sub-scales with BMI, depression, anxiety, stress, emotional eating, uncontrolled eating and negative correlation with physical activity supported the instrument divergent and convergent validity. Yet, it needs to be noted that five items were removed from the original IWQOL-Lite to improve the psychometric properties of the instrument in the studied sample. Also, further investigation and translation optimization need to be considered, as some of the most stringent criteria were not met for the model fit obtained via confirmatory factor analysis.

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