Chinese version Weight-Related Eating Questionnaire to assess psychological aspects of eating behaviours in Chinese adults: abridged secondary publication

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KEY MESSAGES

1. The 13-item Chinese version Weight-Related Eating Questionnaire has good reliability and validity to assess Chinese adults' psychological aspects of eating behaviour including routine restraint, compensatory restraint, susceptibility to external cues, and emotional eating.

2. This instrument can be used to identify the underlying psychological aspects of eating behaviour associated with overeating and obesity so that effective educational and environmental strategies can be designed to reduce the obesity epidemic.

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Introduction

The psychological aspects of eating behaviour include susceptibility to external cues, emotional eating, and dietary restraint (or restrained eating). All are likely to be associated with overeating and high energy intake and hence obesity.[1,2] The most widely used tools to assess the psychological aspects of eating behaviour are the 51-item Three-Factor Eating Questionnaire (TFEQ) and the 33-item Dutch Eating Behaviour Questionnaire (DEBQ). However, the length of these questionnaires is a limitation to their usage.

The 16-item Weight-Related Eating Questionnaire (WREQ) combines the strengths of both the TFEQ and DEBQ.[3] It assesses susceptibility to external cues and emotional eating, routine restraint and compensatory restraint. It has good construct validity and criterion-related validity.[3,4] This study aims to translate the WREQ into Chinese and then validate the Chinese version in Hong Kong Chinese adults.

Methods

In stage 1, linguistic validation was conducted according to the World Health Organization guideline on the process of translation and adaptation. The WREQ was forward-translated to Chinese and then backward-translated to English. Content validity was assessed by an expert panel consisting of a doctor, a nurse, a psychologist, a public health nutritionist, and two dietitians who work in the obesity field. Six new items (three for emotional eating subscale and three for susceptibility to external cues subscale) were added to the Chinese version WREQ (WREQ-C). The 22-item WREQ-C was pilot-tested in 18 Chinese adults. It consists of four constructs of eating behaviours: routine restraint (3 items), compensatory restraint (3 items), susceptibility to external cues (8 items), and emotional eating (8 items). Each item is measured with a 5-point Likert scale: 1 (not at all), 2 (sometimes), 3 (half of the time), 4 (most of the time), and 5 (always).

In stage 2, a convenience sample of 1007 Chinese adults aged ≥18 years from the community were invited to complete an online survey. Those with a self-reported health condition that requires special dietary restriction or a self-reported history of eating disorder diagnosis were excluded.

Psychometric properties of the WREQ-C were first evaluated based on the item response theory (IRT). Polytomous generalised partial credit item IRT models were used to evaluate items within each subscale. Separate models were conducted for each subscale. Item and subscale were evaluated using three criteria: (1) test information area of the subscale to be maintained within 80% of the original structure of the WREQ, (2) subscale retains a convergent construct validity to the relevant DEBQ using hypothesis testing, and (3) internal consistency of the subscale to be maintained (α ≥0.7). Item reduction was conducted when subscales achieved all three criteria, and the item with the lowest discriminative value was removed until the new structure of the subscale failed in one of these criteria.

The reduced scale was then examined for content validity, structural validity, internal

consistency, test-retest reliability, and convergent validity. Structural validity was assessed using a confirmatory factor analysis. A four-factor model was fitted using weighted least square mean and variance-adjusted estimators and categorical variables and was tested using model fit statistics (Chi-square, comparative fit index, Tucker-Lewis index, weighted root mean square residual, and root mean square error of approximation). A priori hypothesis testing was used to evaluate the convergent validity of the WREQ-C using the Chinese version DEBQ as a reference.

Results

The 1007 participants were aged 18 to 71 years; 68% were single; and 78% had a bachelor's degree or above (Table).

In item response theory analyses, a three-item structure was retained for the routine restraint subscale, with a test information area of 17.5. The subscale correlated with the DEBQ restrained eating subscale (r=0.71, P<0.001), with internal consistency of α=0.76. Item 3 showed the lowest discriminative value, but internal consistency dropped below the criteria threshold (α=0.66) when item 3 was removed. Test information curves for the routine restraint subscale displayed items providing more information at higher levels (θ=0) of the latent trait (Fig 1a).
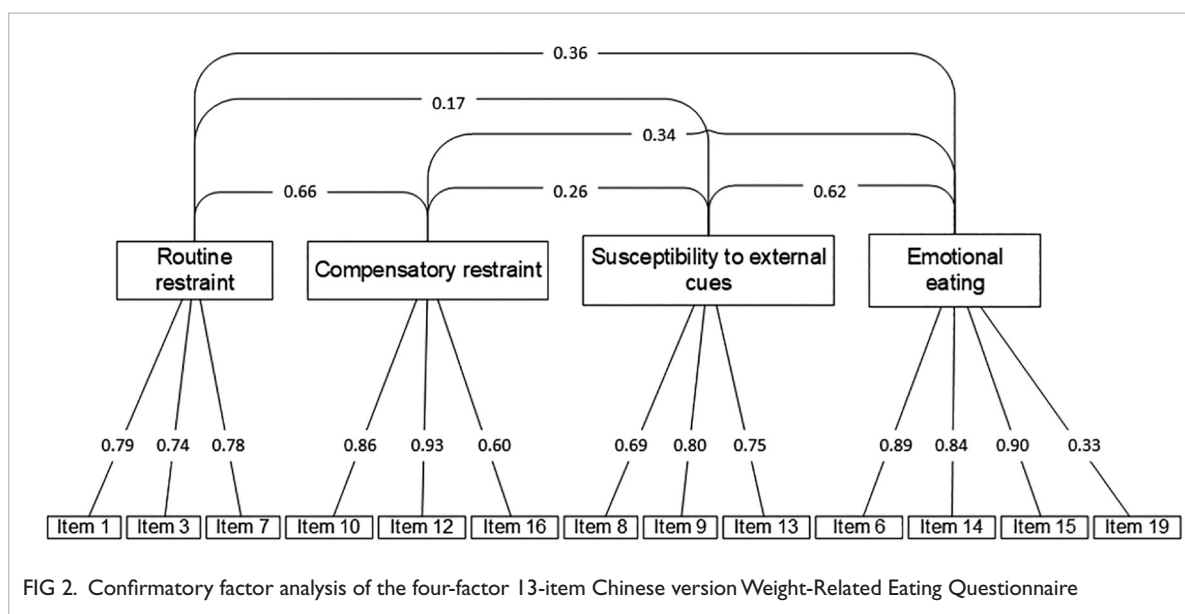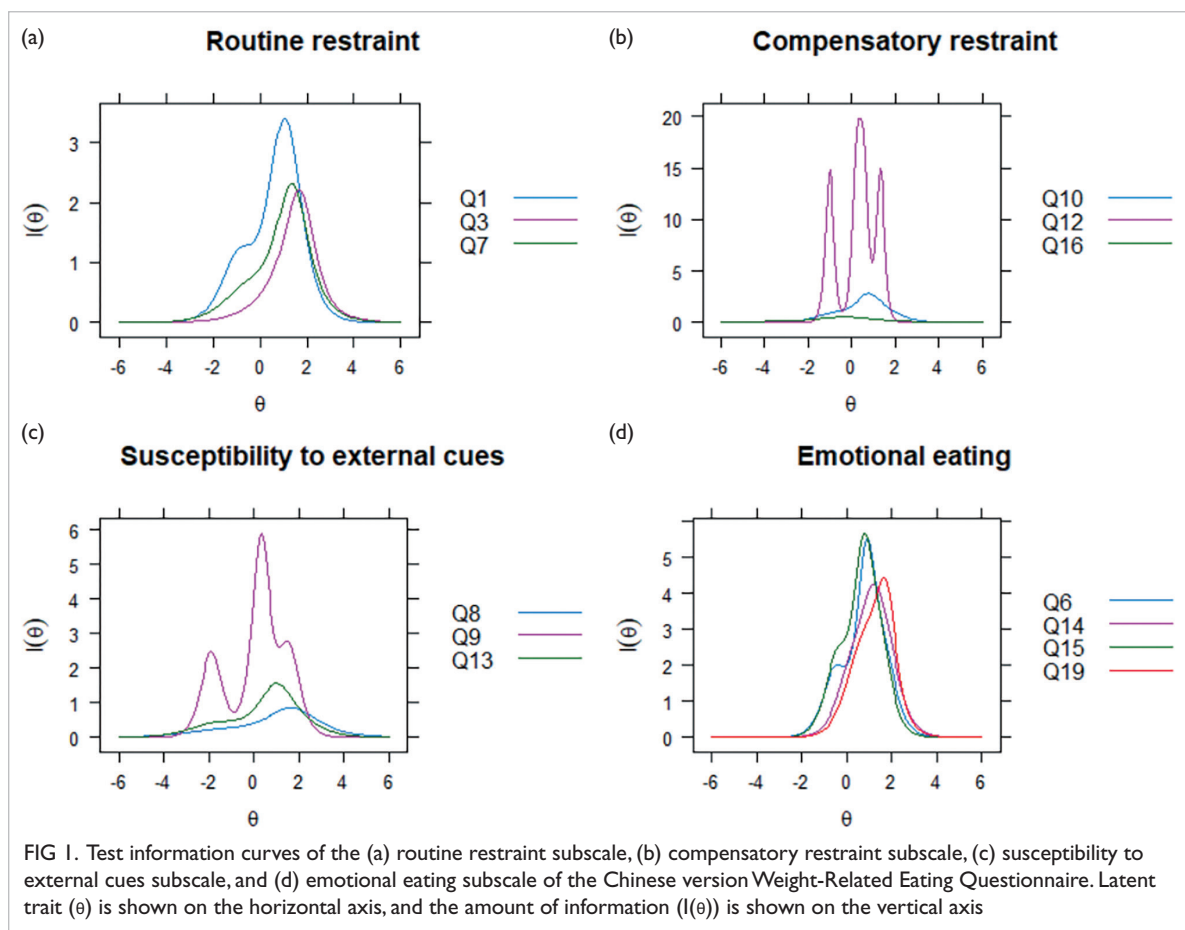
The three-item structure was retained for the compensatory restraint subscale, with a test information area of 32.5. The subscale correlated with the DEBQ restrained eating subscale (r=0.61, P<0.001), with internal consistency of α=0.78. Test information area dropped to <80% of the original when an additional item was removed (test information area of two items was 22.4, which was 69% of the original). Test information curves for the compensatory restraint subscale displayed items providing more information at three separate levels of the latent trait (Fig 1b).

The original susceptibility to external cues subscale had a test information area of 23.4. After adding the three new items (item 20, 21 and 22) and then removing the lowest discriminative value until the criteria could not be maintained, a three-item structure (items 8, 9, and 13) was resulted, with a test information area of 21.7 (93% of the original). Removing any further item resulted in the test information area below 80% of the original structure. The three-item structure of the susceptibility to external cues subscale correlated with the susceptibility to external cues subscale of the DEBQ (r=0.62, P<0.001), with internal consistency of α=0.72. Test information curves for the new structure of the susceptibility to external cues subscale displayed items providing more information at higher ability of the average level (θ=0) of the latent trait (Fig 1c).

TABLE. Characteristics of participants (n=1007)

Characteristic	Value*
Female sex	739 (73)
Age, y	32.6±13.7
≤29	562 (56)
≥30	445 (44)
Body mass index, kg/m² (n=949)	21.3±3.0
Underweight	139 (15)
Normal weight	508 (54)
Overweight	136 (14)
Obese	166 (17)
Self-reported health status	
Extremely well	24 (2)
Very well	240 (24)
Well	361 (36)
Fair	351 (35)
Bad	31 (3)
Marital status (n=1006)	
Single	684 (68)
Married	294 (29)
Divorced/separated/widowed	28 (3)
Employment status	
Full-time	481 (48)
Part-time	37 (4)
Retired/unemployed/homemaker	78 (8)
Student	411 (41)
Education level (n=1006)	
Senior secondary or below	118 (12)
Diploma/certificate/associate degree	104 (10)
Bachelor degree	510 (51)
Master degree or above	274 (27)
Family monthly income, HK$ (n=1000)	
<9999	110 (11)
10 000-19 999	178 (18)
20 000-29 999	196 (20)
30 000-39 999	154 (15)
40 000-59 999	170 (17)
≥60 000	192 (19)
Subscale score	
Routine restraint (1-5)	2.0±0.9
Compensatory restraint (1-5)	2.8±1.0
External eating (1-5)	2.5±0.8
Emotional eating (1-5)	2.1±0.9

* Data are presented as mean±standard deviation or No. (%) of participants

FIG 1. Test information curves of the (a) routine restraint subscale, (b) compensatory restraint subscale, (c) susceptibility to external cues subscale, and (d) emotional eating subscale of the Chinese version Weight-Related Eating Questionnaire. Latent trait (θ) is shown on the horizontal axis, and the amount of information (I(θ)) is shown on the vertical axis

FIG 2. Confirmatory factor analysis of the four-factor 13-item Chinese version Weight-Related Eating Questionnaire

The original structure of the emotional eating subscale had a test information area of 48.5. Three new items (items 17, 18, and 19) were added. After item reduction, a 4-item structure (items 6, 14, 15, and 19) was resulted, with a test information area of 40.5 (83% of the original structure). Removing any further items resulted in the test information area below 80% of the original structure. The 4-item structure of the emotional eating subscale correlated with the diffuse emotion subscale ($r=0.73$, $P<0.001$),

labelled emotion subscale (r=0.79, P<0.001), and emotional eating subscale (r=0.81, P<0.001) of the DEBQ, with internal consistency of α=0.89. Test information curves for the 4-item emotional eating subscale displayed items providing more information at higher ability of the average level (θ=0) of the latent trait (Fig 1d). The IRT analysis resulted in a 13-item WREQ-C structure.

In confirmatory factor analysis of the 13-item WREQ-C, a four-factor model displayed acceptable fit to the data; correlations between items and their designated factors were strong (standardised β>0.6), with an exception of item 19 (Fig 2). Goodness of fit was acceptable in terms of comparative fit index (0.97), Tucker-Lewis index (0.97), and root mean square error of approximation (0.06, P<0.001), but weighted root mean square residual was 1.22, which did not meet the predetermined model fit criteria, with Chi-square being 277.45 (degree of freedom=59, P<0.001).

A sub-sample of 31 participants (61% females) aged 18 to 65 years with different weight status and education levels were asked to complete the questionnaire for a second time after a 2-week interval. The intraclass correlation coefficients (95% confidence interval) for all subscales were high: 0.76 (0.55-0.87) for routine restraint, 0.76 (0.55-0.87) for compensatory restraint, 0.78 (0.57-0.91) for susceptibility for external cues, and 0.89 (0.77-0.97) for emotional eating (all P<0.001).

Discussion

Validity and reliability of the 13-item WREQ-C were maintained, compared with the original English version.[3] Culture has a strong influence on eating behaviour. Six new items (items 17 to 22) were added by the expert panel, but only item 19 (I eat more when I am having relational problems with my family) provided additional information and was retained. This reflects the role of family relationship on emotional eating in Chinese adults.

The four-factor 13-item WREQ-C demonstrated satisfactory convergent validity with the corresponding subscales of DEBQ (r=0.61-0.81), good internal consistency (α=0.72-0.81), and good test-retest reliability (intraclass correlation coefficient of >0.7 for all subscales). The WREQ-C is a reliable instrument to assess Hong Kong adults with various weight status and age groups. The structural validity was good in terms of comparative fit index (>0.90), Tucker-Lewis index (>0.90), and root mean square error of approximation (0.06).

China had the second largest number of obese adults worldwide in 2015, following the United States.[5] As the psychological aspects of eating behaviours including susceptibility to external cues, emotional eating, and restraint eating may be associated with overeating and high energy intake and hence obesity, a reliable and valid instrument to assess these specific eating behaviours is critical in obesity research and clinical practice. The 13-item WREQ-C is a relatively brief, compared with DEBQ and TFBQ. A brief instrument may reduce the response burden and increase completion rates.

One limitation to the present study is the convenience sampling, which may limit the generalisability of the findings to other populations. However, the large sample size of participants with various body weight statuses and ages allows a comprehensive evaluation of the psychometric properties of the WREQ-C.

Conclusions

The 13-item WREQ-C has good reliability and validity to assess Chinese adults' psychological aspects of eating behaviours including routine restraint, compensatory restraint, susceptibility to external cues, and emotional eating. It can be used to identify underlying psychological aspects of eating behaviours associated with overeating and obesity so that more effective educational and environmental strategies can be designed to reduce the obesity epidemic.

Funding

Disclosure

The results of this research have been previously published in:
1. Ho M, Smith R, Chau PH, Chung CY, Schembre SM, Fong DYT. Psychometric evaluation of the Chinese version of a Weight-Related Eating Questionnaire using an item response theory approach. Nutrients 2022;14:1627.

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