Validation of the Self-applied Binge Eating Disorder Scale in Mexican Children

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Abstract

The purpose of the study was to evaluate the psychometric characteristics of the Self-applied Children's Binge Eating Disorder Scale (SA-C-BEDS) as a screening tool for risk of binge eating disorder (BED) in a Mexican child population.

Method: the self-applied version of the C-BEDS was translated into Spanish and adapted, and its reliability, and exploratory and confirmatory validity obtained. It was administered to two samples of elementary school pupils from May-July 2022 through an Internet link.

Results: a total of 378 children (girls=193 and boys=185) with a mean age of 10.22 years, with no differences by sex, answered the questionnaire. “Eating without being hungry” was the main behavior reported (44.8% and 33.7% in girls and boys), followed by eating associated with a certain mood (25% and 21.8% in girls and boys). The scale was distributed within a single factor with a total explained variance of 55%, a significant Bartlett's test of sphericity, 0.80 on the Kaiser-Meyer-Olkin test and an ordinal Alpha reliability of 0.90. Confirmatory validity demonstrated that the model fits the data and is valid.

Conclusion: the SA-C-BEDS is a valid instrument for assessing binge eating behaviors in Mexican children and provides information for identifying and preventing BED cases in a timely manner.

Level of evidence: IV

Background

Childhood obesity is considered a risk factor for chronic diseases [1], low quality of life and psychological problems [2,3]. Data from the World Health Organization (WHO) indicate that, at an international level, the prevalence of overweight and obesity in children and adolescents aged five to nineteen increased from 4% in 1975 to over 18% in 2016 [1,4].

In Mexico, overweight and obesity in pupils aged five to eleven is a priority issue due to the increase in prevalence. The National Health and Nutrition Surveys show that the population reported a combined prevalence of overweight and obesity of 34.8% in 2006, 35.6% in 2018, and 38.2% in 2020 [5–7]. For all of the above reasons, it has become essential to identify the correlates and predictors of the excessive increase in these indicators to reduce rates. While genetics plays a critical role, there are other physiological, social, behavioral, and psychological factors that also have a substantial impact. In this respect, relatively recent evidence suggests that binge eating may play a key role in the development and maintenance of childhood obesity [2].

In regard to eating psychopathology, the international literature shows that between 7% and 17% of children aged seven to twelve present disordered eating behaviors (DEB) and that the prevalence is higher among those suffering from obesity [8]. In Mexico, the National Health and Nutrition Survey (ENSANUT)
found that in boys and girls between the ages of ten and thirteen, concern about weight gain was more frequent, with 11.4% and 11.3%, followed by overeating with 10% and 9.9%, and loss of control over eating, with 7% and 5.8% respectively (ENSANUT, 2006). Franco-Paredes et al. (2017) found that in children aged ten and eleven with overweight and obesity, DEB occurred in 22.9% and 15.9% respectively [9], which coincides with the data reported internationally [10].

Binge eating disorder (BED) is characterized by recurrent episodes of overeating while experiencing a feeling of loss of control over what or how much one is eating, accompanied by great distress, without involving any compensatory behavior and with possible weight gain as a result. Apropos of this, the first meta-analytical review of overweight and obese children and adolescents aged five to twenty-one was recently published. The results showed that binge eating and loss of control over eating prevailed in a quarter of the children regardless of race, sex, age, body mass index or evaluation method [11].

In regard to the research methods used to diagnose binge eating behavior or BED in children, structured and unstructured interviews such as the Kids’ Eating Disorder Survey (KEDS) and the Eating Symptom Inventory (ESI) have predominated. None of them, however, evaluates loss of control, a crucial element in diagnosis [12,13]. The Children’s Eating Disorders Test (ChEDE) and the version for adolescents of the Questionnaire on Weight and Eating Patterns (QEWP-A) have also been used. However, both showed discrepancies when assessing binge eating or loss of control over eating [14,15]. Accurate prevalence estimates are complicated by the plethora of measures used and the lack of a consensus method for diagnosing eating disorders (ED) in children, coupled with unsuitable answer forms, long interviews, and/or open-ended questions that are difficult for the child population to comprehend. When evaluating EDs in children, readily available, age-appropriate interviews are required, given that diagnostic criteria developed for adults may not be appropriate, and that children find it difficult to answer recall questions, or engage in lengthy interviews with open-ended questions. This led Marcus and Kalarchian (2003) to propose provisional criteria for measuring BEDs in children, based on a review and summary of findings from studies focusing on the age of onset of binge eating [16].

As a result, Shapiro et al. (2007) developed the Children’s Binge Eating Disorder Scale (C-BEDS), comprising a simple, understandable, quick, and appropriate structured scale to capture the key characteristics of BED in children aged five to thirteen [17]. The scale contains seven questions based on the critical behaviors proposed by Marcus and Kalarchian. Six of the questions are closed, while the last question measures the duration of the behaviors in weeks. The C-BEDS was evaluated in a study of fifty-five children aged five to thirteen, regardless of body weight [17]. The results showed that approximately half the children reported sometimes eating without being hungry, not being able to stop once they had started to eat and wanting food as a reward for doing something well. Finally, up to 63% of subjects stated that they ate because of negative emotions, meaning that 29% of the total sample met the criteria for an eating disorder. The C-BEDS therefore proved to be a viable alternative and easier to administer to children to identify binge eating behaviors [17].
Finally, the usefulness of the C-BEDS was compared with that of the CHEAT in a sample aged six to twelve. It proved more effective in identifying eating behavior due to negative emotions and the possibility of developing a BED [18]. The potential use of the C-BEDS for clinical screening settings was also explored, with satisfactory results [19].

The objective of the present research was to evaluate the psychometric characteristics of the C-BEDS in a child population from fourth to sixth grade at public schools in the states of Campeche and Mexico in a self-applied version, to avoid the difficulty of undertaking individual diagnostic interviews and to determine the usefulness of this instrument for large-scale surveys. The reliability of the scale and the exploratory and confirmatory validity were obtained in two samples of Mexican children.

**Methods**

**Sample:**

An Internet link was used to obtain a sample of 386 children, eight of which were unwilling to participate, leaving a total of 378, including 193 girls (51.1%), and 185 boys (48.9%), who are elementary school pupils in the states of Campeche (n=249; 51% girls) and Mexico (n=129; 51.2% girls) in the period from May-July 2022. The mean age was 10.22 (SD= 0.94), with no statistical differences by sex, and an age range of eight to twelve. All the children study in the morning shift in four schools in the federal school system of the Ministry of Public Education: two in the State of Campeche and two in the State of Mexico.

The sample was randomly divided into two parts, yielding an initial sample of 197 subjects (96 girls and 101 boys) and a second sample with 181 subjects (97 girls and 84 boys) in order to carry out the statistical analysis.

**Instruments**

The C-BEDS is a brief interview designed to assess the practice of binge eating in children. It comprises seven items based on the characteristic behaviors proposed by Marcus and Kalarchian (2003), six of which are closed questions and one of which measures the evolution of behaviors. Questions are scored 0 (no) and 1 (Yes). Children are classified as having binge eating disorder if they answer “yes” to questions one and two, at least one of questions three to five, have symptoms that have persisted for more than three months (question six), and answer question seven [17].

Shapiro et al. (2007) found that the question on the duration of the evolution of symptoms was not reliable because children lack a clear notion of time beyond three months in the past. For this reason, we deleted question six in the reliability and validity analysis of the scale. We called this version of the questionnaire the Self-Applied Children's Binge Eating Disorder Scale (SA-C-BEDS).

To obtain the definitive version, the scale was translated using the double translation method. This version was used to conduct cognitive laboratories with fifteen children from fourth to sixth grade of elementary school in the State of Morelos, Mexico. They were asked about their understanding of both
the questions and the structure of the questionnaire. The version resulting from this phase was administered to children within this age range to check their understanding of the concepts and answer form. The definitive version was uploaded to an online platform together with a battery of questionnaires that will be used in the near future in the protocol entitled “Multidimensional intervention to improve healthy lifestyle practices and the nutritional and health status of Mexican schoolchildren: development of an intervention platform, randomized trial and escalation proposal,” in collaboration with the National Institutes of Public Health, Medical Sciences and Nutrition, and Psychiatry in Mexico City.

**Procedure**

Contact was established with the school authorities of the area, who, after agreeing to participate in the study, liaised between school principals and researchers. The questionnaires were administered by sending the internet links via WhatsApp, initially to the school principals, and subsequently to the teachers of elementary school pupils from fourth to sixth grade. The teachers subsequently sent them to the parents, who helped their children answer the questionnaires, given that informed consent was requested through the same link.

**Data analysis**

Analyses of frequencies and percentages were conducted with central tendency measures of the demographic variables and for each of the questions on the scale. Reliability and exploratory and confirmatory factor analyses were conducted. The sample was randomly divided into two parts so that the exploratory analysis could be undertaken with one and the confirmatory analysis with the other. SPSS 21.0 [20], Factor [21], and AMOS-13 [22] were used for data analysis.

**Ethical considerations**

The protocol was approved by the Ethics Committee of the National Institute of Public Health on February 6, 2021. The links of the questionnaires sent to parents included informed consent forms for parents or guardians and assent forms for children.

**Results**

**Eating behaviors**

Eating behaviors are shown separately for boys and girls. The main behavior found was eating without being hungry, with 44.8% in girls and 33.7% in boys, followed by eating when they are in a bad, sad, bored or other mood, with 25.0% in girls and 21.8% in boys, followed by eating as a reward for doing something, with 26.0% in girls and 23.8% in boys, followed by being unable to stop eating, with 15.6% and 15.8% respectively, and hiding food, with 18.8% and 12.9% respectively. No statistically significant differences were found by sex.

**Reliability and exploratory validity**
Following an analysis of the internal consistency of the scale, question seven (getting rid of food) was eliminated because its item-total correlation was less than .28. An analysis of the remaining five questions yielded an ordinal alpha value of 0.90 (Table 1).

The scale was distributed within a single factor with a total explained variance of 55%, with a significant Bartlett sphericity test ($B=281.2$, df=10; $p<0.001$) and a Kaiser-Meyer-Olkin test value of 0.80 (KMO).

<table>
<thead>
<tr>
<th>Item</th>
<th>Factorial Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you ever want to eat when you are not even hungry?</td>
<td>.714</td>
</tr>
<tr>
<td>2. Do you ever feel that when you start eating you just cannot stop?</td>
<td>.750</td>
</tr>
<tr>
<td>3. Do you ever eat because you feel bad, sad, bored, or any other mood?</td>
<td>.592</td>
</tr>
<tr>
<td>4. Do you ever want food as a reward for doing something?</td>
<td>.654</td>
</tr>
<tr>
<td>5. Do you ever sneak or hide food?</td>
<td>.631</td>
</tr>
</tbody>
</table>

| Explained variance | .55 |
| Ordinal Alpha | .90 |

**Table 1**

**Factor weightings for the exploratory factor analysis of the Self-applied Binge Eating Disorder Scale in Children**

**Confirmatory validity**

Confirmatory analysis was conducted using the maximum likelihood method. A non-significant Chi-square ($X^2=6.937$, df=5, $p=0.225$), a Root Mean Square Error of Approximation (RMSEA) of 0.046 (below the maximum limit of 0.05), a Goodness of Fit Index (GFI) of .984, and a Comparative Fit Index (CFI) of .974 were obtained. These parameters indicate that the model fits the data and is valid. A single factor consisting of five questions with adequate factor loads was obtained (Figure 1).

**Discussion**

To obtain a self-applicable instrument that makes it possible to evaluate binge eating episodes and the risk of BED in children, the self-applied version of the C-BEDS was translated into Spanish, adapted, and administered to Mexican children ages eight to twelve. The psychometric properties of the questionnaire were also obtained.

The SA-C-BEDS provides a new tool in the field of study of eating disorders in children. It is a self-applied instrument that enables cross-cultural research, as well as evaluations for epidemiological studies, which make it possible to determine the prevalence and impact of BED-related behaviors in the child population.
and consequently develop timely interventions. It is also necessary to have specific instruments for behavior related to loss of control over eating and other behaviors associated with eating disorders, since to date, studies have reported inconsistent prevalence depending on the evaluation instruments used [14]. The SA-C-BEDS has the advantage of being brief. It does not have recall questions that might be difficult to answer in some cases, nor does it have open questions, which can be complicated for children. According to the research conducted, these elements should be considered when evaluating the child population [16]. In addition, a question should be included on loss of control over eating, which is key in the diagnosis of eating disorders, unlike other instruments that do not include it [12,13]. Likewise, adapting it to a self-applied instrument, avoids the limitation observed by Franklin (2019), of causing discomfort in subjects when answering an interview [19].

When evaluating eating behaviors with the SA-C-BEDS, in keeping with the study by Shapiro et al. (2007), which found that 44% of children eat without being hungry, the present study discovered that 44.8% of the girls and 33.7% of the boys claimed to engage in this behavior. However, when other behaviors were evaluated, the percentages were lower than those of the study by Shapiro et al. (2007). When asked whether they ate because they were in a particular mood, 63% of the subjects in the study by Shapiro answered affirmatively, whereas in the present study, 25.0% of the girls and 21.8% of the boys did so. Forty-eight per cent of the respondents in that study wanted food as a reward, as opposed to 26.0% of the girls and 23.8% of the boys in this one. Fifty-two per cent of those in the Shapiro study reported being unable to stop eating, as opposed to 15.6% of the girls and 15.8% of the boys in our sample. Twenty-eight per cent of those in that study reported hiding food, compared with 18.8% of the girls and 12.9% of the boys in this one. In the study by Dmitrzak-Weglarz et al. (2019) of 550 subjects aged between six and twelve, based on the answers to the C-BEDS items, the authors concluded that 12% of the subjects had a substantial risk of presenting an ED, which differs significantly from the original authors’ study, which found that 29% of subjects were at high risk [18]. A comparison with the results of the meta-analysis conducted by He et al. (2017) shows that the global prevalence of binge eating is 22.2% [11] compared with 39.1% in our study, while loss of control over eating was 31.2% as opposed to 15.7% in our study.

Discrepancies are likely due to sample sizes and differences in sample selection. For example, the study by Shapiro et al. (2007) involved children interested in participating in a program designed to improve eating habits and physical activity, the majority of whom were overweight and the offspring of obese parents. The studies included in He et al. (2017) comprised both community and clinical samples. One explanation for the discrepancies found is that according to Franco et al. (2017) and Gowey et al. (2014), disordered eating behaviors occur more frequently in overweight or obese children, which may be the case in some of the studies reviewed by these authors.

Nationwide, the data provided by ENSANUT, which evaluates DEB including loss of control while eating, show that in 2006, 18.3% of the population aged 10 to 19 presented the problem. In 2012, 7% of boys and 5.8% of girls aged between 10 and 13 stated that they were in this situation [5,7]. In the present study, this behavior was present in 15.8% of the boys and 15.6% of the girls. These differences may be related to the
type of sampling and sample size, since this is a nationwide survey with multistage sampling and face-to-face data collection rather than a study with convenience sampling conducted online.

One of the criteria proposed by Marcus and Kalarchian (2003) for BED is that eating should not be associated with the regular use of inappropriate compensatory behaviors [16]. In the C-BEDS, this criterion is reflected in question seven (getting rid of food). However, when internal consistency was evaluated, it was decided to remove it from the scale since its item-total correlation was less than .28. The scale displays excellent internal consistency. The five remaining items obtained an ordinal alpha of .90, distributed in a single factor while the confirmatory validity analysis also showed a single factor with adequate factor loads for the five proposed items, and the model fit the data, proving that it is valid.

Although the measurement instruments available to date have made it possible to study the risk of BED in children, further studies are required in both clinical and population contexts to determine their incidence and acquire a deeper understanding of their characteristics and the circumstances surrounding them and undertake preventive actions and intervention programs in several types of population. Achieving this requires having more instruments to assess the risk of BED in children, especially through self-applied instruments. The present study therefore contributes to the area of study with an instrument with adequate psychometric properties for use in the child population.

**Strength and limits**

The SA-C-BEDS in Spanish is a valid, reliable instrument to measure specific eating behaviors of BED in children. It is brief, and easy to understand and apply. It also provides key information for identifying cases in a timely manner and is useful in the prevention of subsequent BED, as well as related complications. Limitations of the study include the fact that, since it is a self-reported instrument, it is not sufficient to establish a clinical diagnosis of BED. The anthropometric measurements (which would have been useful for characterizing the sample by body weight categories), were based on parents’ reports, which decreases reliability. No other instrument was applied that measured this, as there was no previously validated instrument to enable one to establish concurrent validity. Validations of the scale should be undertaken on its self-reported version in other contexts, which would shed more light on the risk of BED in the child population.

**What is already known on this subject?**

There is currently greater clarity regarding the diagnostic criteria for BED in children. There are also instruments enabling one to determine eating patterns and the existence of eating symptoms, such as the Kids’ Eating Disorders Survey (KEDS), the Eating Symptoms Inventory (ESI), the Children’s Eating Disorders Examination (ChEDE), and the version for adolescents of the Questionnaire on Eating Patterns and Weight (QEWP-A), although these are not designed to assess BED in children. In this respect, the brief interview developed by Shapiro et al., the Children's Binge Eating Disorder Scale (C-BEDS), makes a significant contribution to the evaluation of the risk of childhood BED.
What this study adds

The Spanish version of the SA-C-BEDS is a valid, reliable self-applied instrument that is brief and easy to answer, and specifically designed to detect BED risk behaviors in children.

Declarations

Funding

This study is part of the project entitled “Multidimensional intervention to improve healthy lifestyle practices and nutritional and health status in Mexican schoolchildren: development of an intervention platform, randomized trial and scaling proposal” and was conducted with funding from the Gonzalo Río Arronte Foundation, with grant number 3403 S.680.

Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

Author Contributions

Claudia Unikel Santoncini, Irais Castillo Rangel and Adriana Rivera Castañeda contributed to the study conception and design. Adaptation of the questionnaire and data collection were performed by Claudia Unikel Santoncini, Irais Castillo Rangel, Adriana Rivera Castañeda, Aremis Villalobos Hernández, and María Isidra Hernández Serrato. Data analyses were performed by Francisco Juárez García and Miriam Barajas Márquez. The first draft of the manuscript was written by Claudia Unikel Santoncini, Ana Berenice Casillas Arias, Irais Castillo Rangel and Miriam Barajas Márquez and all the authors commented on previous versions of the manuscript. All the authors read and approved the final manuscript.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics Approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of the Public Health National Institute on February 6th, 2021.

Consent to Participate

Informed consent was obtained from the parents and the children participating in the study.

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**Figures**
Figure 1

Confirmatory Factorial Analysis of the Self-applied Binge Eating Disorder Scale in Children