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The Spanish version of the Three Factor Eating Questionnaire-R21 for children and adolescents (TFEQ-R21C): Psychometric analysis and relationships with body composition and fitness variables

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HIGHLIGHTS

- TFEQ-R21C is a valid and adapted measure of eating behavior in Spanish youth.
- Cognitive restraint factor is the main eating conduct related to body composition.
- Cognitive restraint and uncontrolled eating factors related to fitness level
- "High fitness + normal-weight status" shows different eating pattern in children.

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ABSTRACT

Objective: The main purpose of the present study is to assess the factor structure and reliability of the Spanish version of the 21-item Three Factor Eating Questionnaire (TFEQ-R21C) in children and adolescents and to analyze the relationships between eating behaviors, body composition and cardiovascular fitness.
Subjects: A total of 192 children and adolescents took part in this study (89 boys and 103 girls; aged from 8.8 to 16.8 years old and with body mass index (BMI) ranging from 13.2 to 41.1 kg/m^2). None of them had either a history of psychological or eating disorders.
Measurements: Body composition (dual-energy X-ray absorptiometry-DXA), anthropometrics (body mass, height and BMI), cardiovascular fitness (cyclo-ergometer incremental test) and eating behaviors (TFEQ-R21C) were determined in all participants.
Results: The confirmatory factor analysis corroborated the same three factors of the original TFEQ-R21: Uncontrolled Eating (UE), Emotional Eating (EE) and Cognitive Restraint (CR). The internal-consistency reliability (Cronbach's alpha coefficient) for the questionnaire was 0.73. Significant differences were found in BMI ($F_{2,189} = 3.50$, $p = 0.032$) and total fat mass (TFM) ($F_{2,189} = 3.60$, $p = 0.029$) between tertiles of the CR scale (children who had the lowest scores, also had lower BMI and fat mass). Cardiovascular fitness (measured by relative $VO_{2\ peak}$) differs depending on the UE and CR scores. The "healthy" group (those who were normal-weight and had also the highest relative $VO_{2\ peak}$) showed a significant lower CR ($F_{3,160} = 3.07$, $p = 0.030$) and higher UE ($F_{3,160} = 3.86$, $p = 0.011$) than the "unhealthy" group (those who were neither normal-weight nor had adequate relative $VO_{2\ peak}$).
Conclusions: According to the psychometric analysis of the questionnaire, the TFEQ-R21C is a valid and useful tool to assess eating behaviors in Spanish child population. Further research is necessary to understand the links between eating behaviors and other health-related behaviors such as physical activity time or cardiovascular fitness.

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1. Introduction

The energy imbalance (inadequate nutritional habits and physical inactivity) is considered to be the main reason for both child and adult obesity [1]. However, the causes of obesity have not been fully explained yet. This energy imbalance, which leads to an increase in body weight, is probably caused by the development of several factors (genetic, socio-cultural or environmental) that make obesity a multi-factorial problem [1].

In the last years, it has been suggested that the obesity epidemic needs a multi-strategic approach, which requires the participation of several areas. The most used strategies to fight against obesity in young people have focused on a single strategy or combined ones such as: physical activity (increasing the number of hours of physical activity or reducing sedentary time), nutrition (reducing caloric intake or avoiding certain foods) and behavioral changes towards a healthier lifestyle [2]. There is no consensus about the most adequate and efficient way to reduce childhood obesity rates. Therefore, studying how each of these elements relates to each other can give us useful information in order to develop the most effective interventions.

In Spain, overweight or obesity prevalence ranges between 31 and 44% in 6–9 year-old children [3], however, there is a need for valid and usable instruments in order to evaluate each mentioned factor that contributes to excess body weight. Despite the fact that valid instruments to measure physical activity [4] or energy intake [5] exist, not many tools to assess the cognitive-behavioral nature of food intake [6], and more specifically attitudes towards food (eating behaviors), can be found in Spanish children and adolescents.

In this regard, the Three Factor Eating Questionnaire (TFEQ) [7] is one of the most used tools to assess eating behaviors in different populations [8–10]. Recently, Cappelleri et al. [11] have developed a 21-item questionnaire that evaluates eating behavior through three factors. These factors measure cognitive, behavioral and emotional aspects in human eating attitudes: "Cognitive Restraint" (CR), understood as individuals' conscious efforts to control what they eat in order to keep or lose weight; "Uncontrolled eating" (UE), which expresses the tendency to eat excessively in response to the loss of control over the food itself; and "Emotional eating" (EE), understood as the need to overeat when individuals are unable to cope with emotionally negative situations and moods. This TFEQ-R21 version has been tested in young and adult samples [11–14], but up to date it has not been adapted specifically to child population.

In relation to weight status and eating behaviors, the research highlights that cognitive or restrained eating is positively related to body weight and body mass index (BMI) in children and adolescents whether it is measured using the TFEQ [10,15,16] or the Dutch Eating Behavior Questionnaire [17]. However, emotional and external/uncontrolled eating has not such a clear relationship with overweight in children [18]. Moreover, there are few and inconsistent data about the effects of physical activity on appetite in children. Recently, a study found that children who considered possessing a poor-fair physical fitness had higher scores in CR, UE and EE [14]. However, to the best of our knowledge, there is no data about the relationship between an objective measurement of cardiovascular fitness level and eating behavior in young population.

The purpose of the present study is to validate the Spanish version of the TFEQ-R21, specially adapted to children and adolescents, to allow researchers to assess eating behaviors in this population. More specifically, the first aim was to analyze the psychometric properties and factor structure of our Spanish version of TFEQ-R21 for children and adolescents (TFEQ-R21C). The second objective was to examine the connections between eating behaviors, measured through the factors of the questionnaire, and body composition and cardiovascular levels. Finally, the study has analyzed possible gender, age and pubertal development differences.

2. Methods

2.1. Study population

A total of 192 children and adolescents took part in this study. The sample included 89 boys and 103 girls. The age of the participants ranged from 8.8 to 16.8 years old (mean of 11.8 ± 1.9 years old), and their BMI from 13.2 to 41.1 kg/m^2 (mean of 24.4 ± 5.8 kg/m^2). None of them had either a history of psychological or eating disorders. The subjects were recruited from San Juan Bautista School (36.5%) and Virgen de la Salud Hospital in Toledo (23.4%) and Severo Ochoa Hospital in Leganés (40.1%) (both in Spain). Children referred from hospitals included those who were regularly monitored by physicians to assess the evolution of their overweight or obesity status.

Both parents and children were informed about the aims and procedures of the study, as well as the possible risks and benefits. Children gave their verbal assent and written informed consent was obtained from their parents. The study was performed in accordance with the Declaration of Helsinki of 1975 regarding the ethical principles for medical research involving human subjects, being approved by the Ethical Committee of Clinical Research (CEIC 10/10). Data collection was taken between April–July 2014.

2.2. Validation process of TFEQ-R21C

The TFEQ-R21C (see Appendix 1), the adapted Spanish version of TFEQ-R21 for children and adolescents, was achieved after the following steps:

1) Translation and back translation procedure by two independent Spanish native speakers who are fluent in English.
2) Back translation review and harmonization between the new translation and the source version.
3) A group of experts in childhood nutrition reviewed the translation and adapted the vocabulary to be understandable for children.
4) A pilot study was done with a small group of respondents ($n = 15$) with similar characteristics to the studied sample (9–17 years), and similar in size to previous studies [19,20]. They were asked to make verbal comments in order to verify their understanding of the content of the questionnaire.
5) Review of comments from the pilot study and design of the final version of the questionnaire (TFEQ-R21C).

The final version of the TFEQ-R21C maintains the same number of questions (21 items), the 4-point response scale for answering from the item 1 to item 20 and a 8-point response scale for the item 21, the factors (CR, UE and EE) and the codification of the results proposed by Cappelleri et al. [11].

2.3. Experimental design

All children arrived at the laboratory in a fasted state in the morning. After body composition and incremental exercise tests were done, all participants had a standardized breakfast and TFEQ-R21C was distributed among them. Each participant received verbal and written instructions about how to complete it. Children and adolescents answered the questions by themselves, in presence of a professional that helped to solve any doubt that they could have. The TFEQ-R21C required between 10 and 15 min to be completed. Finally, they completed a self-assessment of the Tanner test in order to register their pubertal development. Participants were divided into pre-pubertal (Tanner status ≤ II) and pubertal (Tanner status ≥ III) groups. In addition, children and adolescents answered a medical and a general questionnaire that included information regarding the number of hours of physical activity per week ("Do you regularly practice physical activity (at least 2 or 3 times per week)" and "Which sport/activity? (including hours per week and years of this sport/activity)"), if they were on a diet or not,