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DEVELOPMENT AND VALIDATION OF A 24-HOUR DIETARY RECALL FOR ASSESSING EATING HABITS

DESENVOLVIMENTO E VALIDAÇÃO DE UM RECORDATÓRIO ALIMENTAR DE 24 HORAS PARA AVALIAÇÃO DOS HÁBITOS ALIMENTARES

DESARROLLO Y VALIDACIÓN DE UN RECUERDO DIETÉTICO DE 24 HORAS PARA EVALUAR LOS HÁBITOS ALIMENTARIOS

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Abstract

Introduction: Assessing eating habits in children and adolescents is fundamental to nutritional epidemiology, but faces considerable methodological challenges. Visual instruments, such as the illustrated 24-hour dietary recall (REC24h), are a promising alternative for improving data collection. The objective of this study is to validate a 24-hour dietary recall with the purpose of quantifying the eating habits of children and adolescents. Methods: A study involving 113 children and adolescents (aged 7 to 16 years) from public educational institutions was conducted. An illustrated 24-hour dietary recall instrument comprising 84 food items was used and evaluated for construct validity (principal component analysis with Varimax rotation), internal consistency (Cronbach's alpha and McDonald's omega), and reproducibility (intraclass correlation coefficient - ICC). Results: Exploratory factor analysis showed the adequacy of the model (KMO = 0.817; Bartlett's test $p<0.001$ for macronutrients). The instrument showed high internal consistency for the overall assessment of the 84 items ($\alpha = 0.87$; $\omega = 0.95$) and for macronutrients ($\alpha = 0.83$; $\omega = 0.91$). The reproducibility assessment showed that the instrument has a good capacity to produce consistent results over time. In conclusion, the illustrated

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REC24h proved to be a tool with construct validity and reliability for measuring the eating habits of children and adolescents. Its ease of use and aesthetic appeal make it a suitable tool for large-scale implementation, with the potential to be used in other populations, although its use needs to be validated for other groups.

Keywords: child, adolescent, dietary recall.

Resumo

Introdução: A avaliação dos hábitos alimentares em crianças e adolescentes é fundamental para a epidemiologia nutricional, porém, enfrenta desafios metodológicos consideráveis. Instrumentos visuais, como o Recordatório Alimentar de 24 horas (REC24h) ilustrado, apresentam-se como uma alternativa promissora para aprimorar a coleta de dados. O objetivo deste estudo consiste em validar um REC24h, com o propósito de quantificar os hábitos alimentares de crianças e adolescentes. Métodos: Utilizou-se uma investigação envolvendo 113 crianças e adolescentes (com idades entre 7 e 16 anos) de instituições de ensino público. Foi utilizado um Instrumento, REC24h ilustrado que compreende 84 itens alimentares, foi avaliado quanto à validade de construto (análise de componentes principais com rotação Varimax), consistência interna (alfa de Cronbach e ômega de McDonald) e reprodutibilidade (coeficiente de correlação intraclasse - CCI). Resultados: A análise fatorial exploratória evidenciou a adequação do modelo (KMO = 0,817; Teste de Bartlett $p<0,001$ referente a macronutrientes). O instrumento apresentou alta consistência interna para a avaliação geral dos 84 itens ($\alpha = 0,87$; $\omega = 0,95$) e para os macronutrientes ($\alpha = 0,83$; $\omega = 0,91$). A avaliação da reprodutibilidade evidenciou que o instrumento apresenta boa capacidade de produzir resultados consistentes ao longo do tempo. Em conclusão, o REC24h ilustrado revelou-se uma ferramenta com validade de construção e fidelidade atribuídas para mensurar os hábitos alimentares de crianças e adolescentes. Sua facilidade de uso e atratividade estética tornam uma ferramenta adequada para implementação em grande escala, com potencial para ser utilizada em outras populações, embora faça necessidade de validação de uso para outros grupos.

Palavras-chave: criança, adolescente, recordatório alimentar.

Resumen

Introducción: La evaluación de los hábitos alimentarios en niños y adolescentes es fundamental para la epidemiología nutricional; sin embargo, enfrenta considerables desafíos metodológicos. Los instrumentos visuales, como el Recordatorio Dietético de 24 horas ilustrado (24hDR), se presentan como una alternativa prometedora para mejorar la recolección de datos. El objetivo de este estudio es validar un

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24hDR con el propósito de cuantificar los hábitos alimentarios de niños y adolescentes. Métodos: Se realizó una investigación que involucró a 113 niños y adolescentes (de 7 a 16 años) de instituciones educativas públicas. Se utilizó un instrumento 24hDR ilustrado que comprendía 84 alimentos y se evaluó la validez de constructo (análisis de componentes principales con rotación Varimax), la consistencia interna (alfa de Cronbach y omega de McDonald) y la reproducibilidad (coeficiente de correlación intraclase - CCI). Resultados: El análisis factorial exploratorio mostró la adecuación del modelo (KMO = 0,817; prueba de Bartlett p < 0,001 con respecto a los macronutrientes). El instrumento mostró una alta consistencia interna para la evaluación general de los 84 ítems (α = 0,87; ω = 0,95) y para los macronutrientes (α = 0,83; ω = 0,91). La evaluación de reproducibilidad demostró que el instrumento tiene una buena capacidad para producir resultados consistentes a lo largo del tiempo. En conclusión, el recordatorio dietético ilustrado de 24 horas demostró ser una herramienta con validez de constructo y fiabilidad reconocidas para medir los hábitos alimentarios de niños y adolescentes. Su facilidad de uso y atractivo estético lo convierten en una herramienta adecuada para su implementación a gran escala, con potencial para su uso en otras poblaciones, aunque se requiere validación para su uso en otros grupos.

Palabras clave: niño, adolescente, recordatorio dietético.

1. **Introduction**

Healthy eating is the foundation for a fulfilling life at all stages of human development. Our nutritional habits shape our well-being and can significantly influence our longevity. On the other hand, poor eating habits can trigger chronic diseases and increase the risk of mortality from noncommunicable diseases (WHO, 2018; GBD, 2017; Makhamatov et al., 2025; Zhang et al., 2023; Ahmad; Akter; Haque, 2023). It is widely recognized that many of the health challenges in adulthood, such as obesity, heart disease, certain types of cancer, osteoporosis, and high blood pressure, have their roots in eating patterns established during childhood and adolescence (WHO, 2005). This fact highlights the importance of monitoring dietary indicators from an early age, justifying the development of assessment tools aimed at children and adolescents to identify the foods that make up their diet.

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In the field of nutritional epidemiology, accurately measuring food consumption represents a significant challenge. Although essential for studies linking diet and health, dietary assessment methods face obstacles such as the complexity of human nutrition and dependence on participants' memory (Willett, 2013; Baranowski, 2013; Vanderhulst, et al., 2018). In response to these difficulties, researchers have constantly sought to develop more efficient and accurate tools. One promising approach is the use of food images in 24-hour dietary recalls (24HR). Compared to traditional methods, this approach simplifies data collection, reduces the time and resources required, and provides a less intrusive experience for participants, as demonstrated in studies with different populations (Bernal-Orozco et al., 2013; Higgins, et al., 2009; Rodrigues, Proença, 2011).

This study details the development and validation of an illustrated 24-hour REC, designed specifically to assess the eating habits of children and adolescents. However, the characteristics that make this instrument effective for young audiences—such as simple language, visually appealing format, and reduced cognitive load—also make it a promising candidate for application in other populations. Simplicity and the use of visual aids can be particularly beneficial for dietary assessment in adults with low literacy levels or cognitive difficulties, populations in which accurate dietary assessment is notoriously challenging (Ptomey, et al., 2013). In addition, a simplified instrument may increase adherence and accuracy of responses in the general adult population, which also benefits from tools that minimize recall effort.

Given the above, this study has a dual objective: first, to validate a questionnaire-based instrument for quantifying the eating habits of children and adolescents that is easy to apply and interpret. Second, the study aims to discuss the potential applicability of this instrument to the adult population, considering that its simplicity and visual appeal may transcend age and cognitive barriers, offering a versatile tool for assessing food consumption in broader contexts.

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2. **Methods**

This methodological study focused on the development, validation, and analysis of the reproducibility of a retrospective food survey in the form of an illustrated, self-administered 24-hour dietary recall (REC24h). The main objective was to create a valid and reliable tool for assessing the food intake of children and adolescents, with potential for secondary application in adults.

Sample and Data Collection

The validation of the final version of the instrument involved 113 children and adolescents aged between 7 and 16 years, enrolled in municipal schools in Anápolis-GO. Data collection was carried out in the classroom, lasting approximately 15 to 20 minutes per application. Before completing the questionnaire, participants received detailed instructions about the study and the instrument, with a researcher present to answer questions.

Construction and Evolution of the Instrument

The construct evaluated in this study concerns the habitual dietary pattern of young people, which refers to the set of foods and nutrients that are usually consumed throughout the day, taking into account quality, diversity, and frequency. Unlike the isolated analysis of nutrients, the focus on dietary patterns helps to understand diet as an integrated behavior, resulting from the interactions between foods and their effects on health (Verger et al., 2021; Parajuli, Prangthip, 2025).

The theoretical basis is supported by the perspective proposed by Walter Willett (2013), which highlights the relevance of global diet assessment in epidemiological studies, and by the work of Hu (2002) and Foster and Bradley (2018), who consolidated the analysis of dietary patterns as the most appropriate methodological strategy for investigating associations between diet and chronic diseases. According to these authors, identifying dietary patterns provides more

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robust estimates of the impact of food on health than the isolated assessment of nutrients.

Thus, the 24-hour dietary recall was structured to operationalize this construct, allowing the estimation of habitual dietary patterns within the methodological limits of the instrument and the study population.

The instrument originated from a food frequency questionnaire proposed by Barros and Nahas (2003), which was subsequently adapted and refined through a series of pilot studies and critical analyses (Barros, Nahas, 2003; Venâncio, 2006; Venâncio, et al., 2013). The main innovation was the incorporation of a visual method, with illustrative pictures of foods, an approach that has been shown to simplify data collection and improve recall accuracy, especially in food frequency questionnaires (Oliveira et al., 2023; Souza et al., 2016).

The REC24h was structured to assess food consumption in six distinct meals: breakfast, morning snack, lunch, afternoon snack, dinner, and supper. For each meal, a consistent set of 84 food and beverage icons is presented, allowing participants to mark the items consumed and note the quantity in household units of measurement (e.g., slices, cups, spoons), facilitating recall and analysis of daily consumption frequency (Assis et al., 2007; Arsenault et al., 2020).

Throughout its development, the instrument underwent multiple versions. Initially, foods were grouped together, evolving into an individualized presentation for greater detail. Subsequent versions tested different ways of quantifying portions, culminating in the current format, which provides space for participants to record the amount eaten next to each item. The layout and illustrations were also optimized for black and white printing, aiming at the feasibility of large-scale application in environments with limited resources, such as public schools. The final version was consolidated after the collaboration of professionals in the areas of nutrition, pedagogy, physical education, and Portuguese language, who contributed to the clarity, organization, and adequacy of the content.

Calculation of the instrument

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REC24h is a well-structured instrument for collecting demographic information (gender and age), self-reported anthropometric measurements (weight and height), and data on food consumed in the last 24 hours. Food consumption is assessed using a retrospective food recall, applied according to a standardized script covering the following meals: breakfast, school snack/lunch, lunch, afternoon snack/lunch, dinner, and supper. The standardization of the order of questions and the arrangement of meals aims to reduce omission rates and ensure consistent application.

Food classification was based on the food pyramid of the Brazilian Society of Pediatrics, Department of Nutrition (2018), which divides foods into four groups: (1) carbohydrates (cereals, breads, tubers, and roots), recommended intake of 5 to 9 servings per day; (2) fiber sources (vegetables, legumes, and fruits), 4 to 5 servings per day; (3) proteins (milk and dairy products, meats, eggs, and legumes), 5 to 7 servings per day; and (4) fats and sugars, 2 to 4 servings per day. With the adoption of this normative reference, there is now a technical plan for the classification of foods, which facilitates comparability between different studies.

Consumption is measured in standardized household units (e.g., spoon, cup, slice, unit), defined in advance in the instrument. The quantities are then converted into servings according to the criteria defined by the reference used. Eating habits are assessed by adding up the portions consumed in each food group, which allows verification of whether the recommendations for the age group are correct, as shown in Table I. The detailed description of the steps for data collection, categorization, and design makes it possible to reproduce the method in other population contexts and gives the measurement process greater methodological rigor.

Statistical Analysis

The analyses were performed using IBM SPSS Statistics® (version 23.0). First, the database was checked to identify inconsistencies, missing information, variable distribution, and outliers. For the nutritional characterization of the sample, foods were organized into groups of nutritional components (carbohydrates,

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proteins, lipids, sugars, and fibers), according to the guidelines of the Brazilian Society of Pediatrics. Portions were classified as insufficient, adequate, or excessive. It should be noted that these groupings were not used as an input matrix in the factor analysis, but were used solely for descriptive analysis.

The internal structure was verified through Exploratory Factor Analysis (EFA), using as an input matrix the consumption frequency values corresponding to 84 original food items from the instrument. The conformity of the correlation matrix was assessed using the Kaiser-Meyer-Olkin (KMO) index and Bartlett's sphericity test. The factors were obtained using the principal axis method. The definition of the number of factors simultaneously considered: eigenvalues > 1.0; visual inspection analysis, theoretical consistency, and clinical interpretability of the model. Varimax orthogonal rotation was used to simplify the interpretation of factor loadings. In the model, elements with factor loadings ≥ 0.30 and no significant cross-loadings were preserved.

Internal consistency was assessed using Cronbach's alpha coefficient, calculated independently for food groups that are conceptually homogeneous (ultra-processed foods; fruits and vegetables; protein sources), respecting the principle of unidimensionality. The alpha coefficient was applied based on classic guidelines for analyzing internal consistency among items with the same latent dimension (Sreiner, 2003). Values ≥ 0.70 were considered adequate for instruments in the initial phase of psychometric evaluation.

Temporal stability was verified using the Intraclass Correlation Coefficient (ICC), using a 95% confidence interval, adopting a bidirectional mixed effects model and an absolute agreement estimate (ICC). The interpretation follows established criteria: values <0.40 indicate low reproducibility; those ranging from 0.40 to 0.75 indicate moderate reproducibility; and values >0.75 indicate high reproducibility.

The research was approved by the Research Ethics Committee (Opinion No. 5,924,646).

It is important to note that, when assessing dietary habits, there is no

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consensus on the existence of a method that is recognized as the absolute gold standard. Traditional methods, such as detailed food records, multiple food records included by multiple nutritionists administered by nutritionists, or biomarkers, have their intrinsic limitations, or in children, such as memory bias, over-reporting, behavioral reactivity, and high operational complexity. In view of this, this study focused on the structural and operational standardization of the 24-hour REC, prioritizing a clear application script, the systematization of home measurements, and the categorization of foods according to the normative reference of the Brazilian Society of Pediatrics (2018). In addition, the available biomarkers indicate the intake of certain nutrients but do not comprehensively capture the usual dietary pattern or the organization of meals throughout the day.

Given this scenario, this study focused on the structural and operational standardization of REC24h, prioritizing a clear application script, the systematization of home measurements, and the categorization of foods according to the normative reference of the Brazilian Society of Pediatrics (2018). The adoption of previously defined criteria for the composition of food groups and portions aimed to ensure the internal consistency, comparability, and reproducibility of the instrument.

Thus, this research establishes itself as a methodological step in consolidating the instrument, with a view to its organization, standardization, and application in the school environment, knowing that future analyses may enrich the evidence of validity in other contexts of use.

3. Results

The data analysis shows that the instrument has solid psychometric properties for assessing eating habits in the sample studied. The main quantitative results supporting the validity and reliability of the REC24h are presented below.

The exploratory factor analysis, shown in Table 1, revealed the presence of a single factor, with a total variance of 71.3%, suggesting that the questionnaire items converge to assess a cohesive construct, conditioned by the dietary pattern. The factor loadings assigned to the food groups had high values, ranging from 0.73

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(Fiber) to 0.93 (Protein), which shows the intense manifestation of each group with the latent factor.

Table 1: Exploratory Factor Analysis (n=113)

Factors	Factor 1	Singularity
Carbohydrates	0,84	0,295
Proteins	0,93	0,138
Fibers	0,73	0,462
Sugars/fats	0,86	0,254
Total variance (%)	71,3	
Cumulative total variance (%)	71,3	

Source: Author's own work

The quality indicators of the model referring to the complete instrument (84 items) and the analysis of macronutrients are specified in Tables 2 and 3, respectively. A KMO index of 0.536 and Bartlett's test ($p<0.001$) attest to the factorability of the data matrix. Internal consistency was exceptional, with a Cronbach's alpha coefficient of 0.87 and a McDonald's omega coefficient of 0.95. Tangential to the macronutrient model, the fit was even more pronounced (KMO = 0.817), with high internal consistency (α 0.83; ω = 0.91), which corroborates the cohesion of the grouped items.

Table 2: Indicators of Adherence, Quality, and Internal Consistency of the Model (84 items)

Index	Value
Adherence	
Total KMO	0,536
Bartlett's Test	X^2 = 8998 (GL=3486, p<0,001)
Quality	
RMSEA (IC95%)	0,077 (0,074 a 0,082)
TLI	0,504
Internal Consistency	Cronbach's α / McDonald's ω

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Index	Value
Overall	0,87 / 0,95

Legend: KMO (Keiser-Meier-Olkm); RMSEA (Root Mean Square Error of Approximation); TLI (Tucker-Lewis Index); DF (Degrees of Freedom); CI (Confidence Interval).

Table 3: Indicators of Model Adherence, Quality, and Internal Consistency (Macronutrients)

Index	Value
Adherence	
Total KMO	0,817
Bartlett's test	X^2 = 306 (GL=6, p<0,001)
Quality	
RMSEA (IC95%)	0,154 (0,047 a 0,282)
TLI	0,946
Internal Consistency	Cronbach's α / McDonald's ω
Overall	0,83 / 0,91

Legend: KMO (Keiser-Meier-Olkm); RMSEA (Root Mean Square Error of Approximation); TLI (Tucker-Lewis Index); DF (Degrees of Freedom); CI (Confidence Interval).

4. **Discusión**

This study successfully demonstrates the construct validity and reliability of an illustrated 24-hour dietary recall (REC24h) designed to assess the eating habits of children and adolescents. The main finding is that the instrument demonstrates satisfactory internal consistency and reproducibility, making it a reliable tool for nutritional epidemiology research in this demographic group.

The practical implications of this research are of great importance. The development of an accessible instrument that is simple to apply and interpret, optimized for black and white printing, enables its large-scale use in resource-poor environments, such as public educational institutions. The tool can be used by researchers, nutritionists, and public health professionals to monitor eating habits, evaluate nutritional interventions, and conduct epidemiological studies that aim to associate diet with health outcomes in children and adolescents.

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The Cronbach's alpha coefficient obtained, which is 0.83 for macronutrients and 0.87 for the general instrument, exceeds the threshold of 0.70, often recognized as a sign of adequate internal consistency (Sreiner, 2003; Couto, Cavallaro, Noronha, 2024). This result is consistent with other studies validating food frequency questionnaires aimed at adolescents (Bonato et al., 2014; Koch et al., 2021), corroborating the robustness of our findings. The sample set of 113 individuals exceeds the minimum limit of 50 reports per food item, a guideline commonly suggested to ensure the consistency of analyses in validation studies (Thompson, Subar, 2017), thus providing an increase in the statistical power of the findings.

A common practice in assessing habitual food intake is the requirement that at least 50 respondents report consumption of the food of interest in the 24-hour dietary recall to ensure the representativeness and accuracy of the data collected (Thompson, Subar, 2017; Deitchler, et al., 2020). In the present study, the sample to validate the instrument consisted of 113 participants, which not only meets but exceeds the recommendations in the literature. This adequate sample size reinforces the robustness and reliability of the results obtained, as evidenced in recent studies that highlight the importance of sufficiently large samples for the validation of dietary assessment instruments (Carvalho, et al., 2021; Silva, et al., 2022).

To ensure that the food recall reliably reproduces the reality it aims to measure, Cronbach's alpha coefficient was used, a statistical measure that expresses, through a single factor, the degree of reliability of the responses obtained from the questionnaire. Usually, alpha values between 0.80 and 0.90 are preferred (Cronbach, 1951). In the present study, we found a value of 0.81. According to established standards, values above 0.70 are indicative of satisfactory consistency, while those approaching 1.00 are considered ideal (Xu, *et al.,* 2021). This rigorous criterion ensures the reliability and robustness of the results obtained, supporting the validity of the analysis performed, confirming the reliability of the 24-hour REC, which is considered an adequate instrument for assessing the eating habits of children and adolescents.

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Some authors demonstrate that methods that assess food intake through food images have overcome many of the limitations of traditional self-reporting. Based on this data, the present study chose to develop a 24-hour dietary recall that included images, as this approach could overcome many of the limitations associated with traditional self-reporting methods. food images offer a more accurate, detailed, and visually appealing way to estimate food intake. In the study conducted by Xu et al. (2021) to assess the relative validity of the 24-hour REC with visual resources using images and photographic records of the diet to measure energy and nutrient intake in preschoolers, the researchers concluded that even with only one day of recording, the instrument proved to be a valid and reliable tool for measuring energy and nutrient intake in this age group.

Accurate assessment of food consumption in epidemiological studies represents a significant challenge for researchers, especially given the scarcity of studies validating food assessment instruments in adolescents in Brazil. It is widely recognized that the applicability of food recall in a given population may not translate into similar performance in another population, requiring an individualized assessment for each context. Thus, the search for new techniques and methods to correct measurement errors is essential to improve the accuracy and reliability of the 24-hour REC.

The use of a visual method reinforces a growing trend in the literature, which indicates a superiority in the effectiveness of image-assisted reminders over approaches based exclusively on memory (Ptomey et al., 2017). Although this study did not provide a direct comparison between a method with illustrations and one without illustrations, the high fidelity observed suggests that the visual approach was effective in reducing cognitive load and facilitating self-reporting, especially in the young population.

The present study successfully demonstrated the construct validity and reproducibility of an illustrated 24-hour dietary recall (REC24h) for assessing eating habits in children and adolescents. The results indicated satisfactory internal consistency (Cronbach's α = 0.81), in line with reliability standards that recommend values above 0.70. The good reproducibility, confirmed by the Intraclass Correlation

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Coefficient (ICC), corroborates other studies validating dietary instruments (Bonatto, et al., 2014; Koch, et al., 2021). These findings are particularly relevant given the scarcity of validated instruments for adolescents in Brazil, filling an important gap in nutritional epidemiology.

One of the main innovations of this instrument is the use of images to facilitate self-reporting, an approach whose effectiveness is increasingly recognized in the literature. Studies show that photo-assisted dietary assessment methods can significantly increase the accuracy of energy and macronutrient intake estimates, overcoming the limitations of traditional reporting based solely on memory (Koch, et al., 2021). For example, a study of adults with intellectual and developmental disabilities showed that the use of photos resulted in significantly higher and more accurate estimates of caloric intake compared to standard recall (Koch, *et al.,* 2021). Although the present study did not directly compare the method with and without images, the design of the instrument is based on this principle, seeking to reduce the cognitive load and improve the accuracy of responses, which proved effective in the child and adolescent population evaluated.

The main focus of this discussion, however, revolves around the potential applicability of the REC24h beyond the child and adolescent population, which should be considered with caution. The use of simplified language, intuitive structuring, and the presence of visual resources could, in principle, favor its use in other age groups. However, as emphasized in the literature, the validity of an instrument is specific to the population in which it was evaluated, requiring its own analysis and formal validation before any expansion of its use.

For adults, especially those with low educational attainment or who have some difficulty with interpretation and memory, traditional approaches to food recording may face difficulties. Thus, the idealization of a simplified and visually oriented instrument can be seen as a good start, but further research is still needed.

However, this conjecture remains in the realm of hypothesis. One limitation to note is that the present study did not include validation of the instrument in adults, which makes it impossible to generalize the results to other age groups. In addition, attributes such as simplified design and reduced reproduction costs could, in theory,

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favor its application in public health settings, based on specific research that proves its validity and reliability in adults. Thus, it is suggested that future investigations conduct validation studies, comparing the performance of the presented REC24h with reference methods in samples of adult individuals.

It is important to consider the limitations of this investigation. Initially, validation occurred in a particular sample of children and adolescents from municipal schools in a single city, which limits the scope of the results to other populations with different sociocultural and geographic profiles. Secondly, an important limitation is the lack of validation of the instrument for the adult population. Although the study analyzes REC24h predictions for adults, particularly for individuals with low literacy levels, this is an assumption that has not yet been verified. The validity of an instrument is specific to the population in which it was studied, and the direct application of the results is, from a methodological perspective, specific. Finally, a well-established method, such as rigorous measurement of food intake or the application of biomarkers, was not used for concurrent validation, which could provide an even more accurate measurement.

Based on the results obtained and the limitations indicated, it is recommended that subsequent research focus on the formal validation of the REC24h in the adult population, including groups with varying levels of education and located in different regions of the country. Comparative analyses examining the performance of the instrument in relation to a gold standard method were of great importance in determining its accuracy. In addition, the use of digital versions of the questionnaire, such as mobile applications or online platforms, could further expand its reach and effectiveness in obtaining data.

4. Conclusión

This study successfully achieved its primary objective of validating an illustrated 24-hour dietary recall (REC24h), confirming it as an instrument with solid construct validity and good reproducibility for assessing the eating habits of children and adolescents. The statistical results, especially the high internal consistency ($\alpha > 0.80$) and factorial structure, confirm its reliability and robustness

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for use in this demographic group.

The main contribution of this study is to offer an easily accessible and applicable methodological tool that can be used in large-scale investigations, particularly in contexts with limited resources, such as the school environment. The presentation of accessible language with visual resources proved to be an effective approach to engage young audiences and optimize the accuracy of self-reporting, a challenge identified in nutritional epidemiology.

In summary, the illustrated REC24h constitutes a significant methodological advance for nutritional research in Brazil, providing a viable and validated alternative for monitoring the eating habits of children and adolescents. We suggest its application in clinical practice and research with this group, in addition to encouraging further research to explore their emotions in different situations.

Referências

ASSIS, M. A. A. *et al*. Reproducibility and validity of a food consumption questionnaire for schoolchildren. **Public Health Journal**, São Paulo, v. 43, n. 4, p. 595-603, 2007. Available at: https://rsp.fsp.usp.br/wp-content/uploads/articles_xml/1518-8787-rsp-41-06-1054-CKDyf/1518-8787-rsp-41-06-1054-CKDyf.pdf. Accessed on: Jan. 2, 2025.

AHMAD, R.; AKTER, F.; HAQUE, M. Diet and nutrition for non-communicable diseases in low and middle-income countries. **Frontiers in Nutrition**, v. 10, p. 1179640, 2023. Available at: https://www.frontiersin.org/journals/nutrition/articles/10.3389/fnut.2023.1179640/full. Accessed on: Feb. 1, 2026.

ARSENAULT, J. E. *et al*. Validation of 24-h dietary recall for estimating nutrient intakes and adequacy in adolescents in Burkina Faso. **Maternal & child nutrition**, v. 16, n. 4, p. e13014, 2020. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC7503205/pdf/MCN-16-e13014.pdf. Accessed on: Jan. 2, 2026.

BARANOWSKI, T. 24-Hour recall and diet record methods. In:mWILLETT, W. **Nutritional Epidemiology.** 3rd ed. New York: Oxford University Press; 2013. p. 49-69. Available at: https://books.google.com.br/books?hl=pt-BR&lr=&id=UKs3VaEtNukC&oi=fnd&pg=PP2&dq=Nutritional+epidemiology&ots=xwNjYk0_yv&sig=l6kwj13SYIpfkIS47ZjGX-aBao4&redir_esc=y#v=onepage&q=Nutritional%20epidemiology&f=false. Accessed on: Feb. 1, 2025.

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 08/03/2026
Vol: 13.02
DOI: 10.66104/mqr9dj86
Pages: 1-21

BARROS, M. V.; NAHAS, M. V. **Measures of physical activity: theory and application in different population groups**. Londrina: Midiograf, 2003.

BERNAL-OROZCO, M. F. *et al*. Validation of a Mexican food photograph album as a tool to visually estimate food amounts in adolescents. **British journal of nutrition**, v. 109, n. 5, p. 944-952, 2013. Available at: https://www.cambridge.org/core/journals/british-journal-of-nutrition/article/validation-of-a-mexican-food-photograph-album-as-a-tool-to-visually-estimate-food-amounts-in-adolescents/42547DF3379C7DDDD8818CE58053CFF1. Accessed on: February 17, 2025.

BONATTO, S. *et al.* Reproducibility, relative validity, and calibration of a food frequency questionnaire for adults in the Porto Alegre Metropolitan Region, Rio Grande do Sul, Brazil. **Public Health Notebooks**, v. 30, n. 9, p. 1837-1848, Sept. 2014. Available at: https://www.scielo.br/j/csp/a/Y8Yk7YmZgP9DjQ7zWYgsThw/?format=pdf&lang=pt . Accessed on: June 19, 2025.

BONATTO, S. *et al.* Validity and reproducibility of a food frequency questionnaire for adolescents. Revista de Saúde Pública, v. 48, n. 6, p. 929–938, 2014. Available at: https://www.scielo.br/j/csp/a/KTgWpwgB3YLQ5LSKC4ZVQ9C/

BÖRNHORST, C. *et al.* Validity of 24-h recalls in (pre-) school aged children: comparison of proxy-reported energy intakes with measured energy expenditure. **Clinical Nutrition**, v. 33, n. 1, p. 79-84, Feb. 2014. Available at: https://www.clinicalnutritionjournal.com/article/S0261-5614(13)00096-4/abstract. Accessed on: Sept. 15, 2025.

BRAZILIAN SOCIETY OF PEDIATRICS – Department of Nutrition. **Nutrition Manual:** guidelines for infant to adolescent nutrition, at school, during pregnancy, in disease prevention and food safety / Brazilian Society of Pediatrics. Scientific Department of Nutrition. 4th ed. São Paulo: SBP, 2018.172p. Available at: https://pediatriadescomplicada.com.br/wp-content/uploads/2020/08/MANUAL-ALIMENTACAO-.pdf. Accessed on: Nov. 10, 2023.

CARVALHO, A. M. *et al*. Measuring sustainable food systems in Brazil: A framework and multidimensional index to evaluate socioeconomic, nutritional, and environmental aspects. **World Development**, Oxford, v. 143, p. 105470, Jul. 2021. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0305750X21000826?via%3Dihub. Accessed on: Sept. 23, 2024.

COUTO, L.M.F.; CAVALLARO, A.P.O.; NORONHA, A.P.P. Exploratory factor analysis and invariance analysis of the Vitality Scale (EV). Psico-USF, v. 29, p. e271465, 2024. Available at:

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 08/03/2026
Vol: 13.02
DOI: 10.66104/mqr9dj86
Pages: 1-21

https://www.scielo.br/j/pusf/a/wrMjSFJnm74rQXZzqsFHhsR/?format=html&lang=pt

CRONBACH, L. J. **Coefficient alpha and the internal structure of tests.** ***Psychometrika*****,** New York, v. 16, n. 3, p. 297-334, 1951. Available at: https://sci-hub.st/10.1007/bf02310555. Accessed on: Oct. 29, 2024.

DEITCHLER, M. *et al.* Planning and Design Considerations for Quantitative 24-Hour Recall Dietary Surveys in Low-and Middle-Income Countries. **Intake–Center for Dietary Assessment/FHI Solutions; Intake–Center for Dietary Assessment/FHI Solutions**, Washington, DC, USA, Jan. 2020. 44p. Available at: https://www.intake.org/sites/default/files/2020-02/Intake-Considerations-Brief-Feb2020.pdf. Accessed on: Nov. 2, 2024.

FOSTER, E.; BRADLEY, Jr. Methodological considerations and future insights for 24-hour dietary recall assessment in children. **Nutrition research**, v. 51, p. 1-11, 2018. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0271531717305869?via%3Dihub. Accessed on: Jan. 5, 2025.

GBD 2017 DIET COLLABORATORS. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet, London, v. 393, n. 10184, p. 1958-1972, 2019. Available at: https://www.thelancet.com/action/showPdf?pii=S0140-6736%2819%2930041-8 . Accessed on: Jan. 14, 2025.

HIGGINS, J. A. *et al.* Validation of photographic food records in children: are pictures really worth a thousand words? **European Journal Of Clinical Nutrition**, v. 63, n. 8, p. 1025-1033, 2009. Available at: https://www.nature.com/articles/ejcn200912. Accessed on: April 15, 2024.

HU, F. B. Dietary pattern analysis: a new direction in nutritional epidemiology. **Current opinion in lipidology**, v. 13, n. 1, p. 3-9, 2002. Available at: https://journals.lww.com/co-lipidology/fulltext/2002/02000/Dietary_pattern_analysis__a_new_direction_in.2.aspx Accessed on: Feb. 10, 2025.

KOCH, S. A. J. et al. Validation of the web-based self-administered 24-h dietary recall myfood24-Germany: comparison with a weighed dietary record and biomarkers. **European Journal of Nutrition**, Heidelberg, v. 60, n. 7, p. 4069-4082, 2021. Available at: https://link.springer.com/article/10.1007/s00394-021-02547-7. Accessed on: Feb. 2, 2025.

LI, M. *et al*. Reproducibility and validity of low-carbohydrate diet and low-fat diet scores derived from 24-hour dietary recalls. **American Journal of Epidemiology**, v. 194, n. 9, p. 2724-2732, 2025. Available at: https://academic.oup.com/aje/article/194/9/2724/8123640 . Accessed on: Jan. 3,

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 08/03/2026
Vol: 13.02
DOI: 10.66104/mqr9dj86
Pages: 1-21

2026.

OLIVEIRA, G. A. L. *et al*. Validation of the illustrated questionnaire on food consumption for Brazilian schoolchildren (QUACEB) for 6-to 10-year-old children. **Front Public Health**, v. 11, p.1051499, 2023. Available at: https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2023.1051499/full. Accessed on: Oct. 10, 2025.

MAKHAMATOV, U. *et al*. Organizing healthy and safe nutrition in non-communicable diseases. **Shokh Articles Library**, v. 1, n. 1, 2026. Available at: https://worldsiencepub.com/index.php/shokhal/article/view/3799/3638 Accessed on: Feb. 10, 2026.

NUNNALLY, J. C.; BERNSTEIN, I. H. **Psychometric theory**. 3rd ed. New York: McGraw-Hill, 1994. Available at: https://sci-hub.st/10.1177/014662169501900308. Accessed on: Oct. 10, 2025.

PARAJULI, J.; PRANGTHIP, P. Adolescent nutrition and health: a critical period for nutritional intervention to prevent long-term health consequences. Current nutrition reports, v. 14, n. 1, p. 1-14, 2025.Available at: https://link.springer.com/article/10.1007/s13668-025-00706-4. Accessed on: Jan. 2, 2026.

PTOMEY, L. T. *et al*. Photo-assisted recall increases estimates of energy and macronutrient intake in adults with intellectual and developmental disabilities. Journal of the Academy of Nutrition and Dietetics, Chicago, v. 113, n. 12, p. 1704-1709, 2013. Available at: https://pubmed.ncbi.nlm.nih.gov/24095784/ Dec. 29, 2025.

RODRIGUES, P. R. M.; PROENÇA, R. P. C. The use of photography in the evaluation of food consumption: a review. Nutrition Magazine, Campinas, v. 24, n. 4, p. 627-637, 2011. Available at: https://www.scielo.br/j/rn/a/DmNCrkpVvHtHLB9y8wpj7pH/?format=pdf&lang=pt. Accessed on: Sep. 17, 2024.

SILVA, T. D. *et al*. Childhood obesity and eating habits: the consequences in adult life. Brazilian Journal of Exercise Physiology, São Paulo, v. 21, n. 5, p. 322-328, 2022. Available at: https://www.convergenceseditorial.com.br/index.php/revistafisiologia/article/view/5406/8417. Accessed on: Feb. 2, 2025.

SOUZA, R. G. M. *et al*. Validation of food photographs for estimating food consumption. Nutrition Journal, v. 29, n. 03, p. 415-424, 2016. Available at: https://www.scielo.br/j/rn/a/H8tD8dXfdH86BPQ3w57Xsfx/?format=pdf&lang=pt. Accessed on: Jan. 30, 2026.

STREINER, D. L. Starting at the beginning: an introduction to coefficient alpha and

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 08/03/2026
Vol: 13.02
DOI: 10.66104/mqr9dj86
Pages: 1-21

internal consistency. Journal of Personality Assessment, Mahwah, v. 80, n. 1, p. 99-103, 2003. Available at: https://sci-hub.ru/10.1207/S15327752JPA8003_01. Accessed on: Feb. 2, 2025. 2025.

THOMPSON, F. E.; SUBAR, A. F. Dietary assessment methodology. In: COULSTON, A. M. *et al*. (ed.). **Nutrition in the prevention and treatment of disease**. 4th ed. San Diego: Academic Press, 2017. p. 5-48. Available at: https://epi.grants.cancer.gov/dietary-assessment/Chapter%201_Coulston.pdf. Accessed on: Oct. 10, 2024.

VANDERHULST, E. *et al*. Association of dietary habits and interest for food and science versus weight status in children aged 8 to 18 years. **Journal of obesity**, v. 2018, n. 1, p. 4061385, 2018. Available at: https://onlinelibrary.wiley.com/doi/epdf/10.1155/2018/4061385. Accessed on: Feb. 10, 2025.

VENÂNCIO, P. E. M. *et al*. Lifestyle in school children of Anápolis-Go. **FIEP Bulletin**, Foz do Iguaçu, v. 83, p. 567-569, 2013. Available at: https://ojs.fiepbulletin.net/index.php/fiepbulletin/article/view/2958. Accessed on: June 25, 2024.

VENÂNCIO, P. E. M. **Obesity, physical activity, and eating habits in schoolchildren in the city of Anápolis-GO**. 2006. Dissertation (Master's) – Catholic University of Brasília, Brasília, 2006. Available at: https://bdtd.ucb.br:8443/jspui/bitstream/123456789/1065/1/Texto%20Completo.pdf . Accessed on: July 29, 2024.

VERGER, Eric O. *et al*. Dietary diversity indicators and their associations with dietary adequacy and health outcomes: a systematic scoping review. **Advances in Nutrition**, v. 12, n. 5, p. 1659-1672, 2021. Available at: https://www.sciencedirect.com/science/article/pii/S2161831322004616. Accessed on: Jan. 16, 2026.

WILLETT, W. Issues in analysis and presentation of dietary data. In: WILLETT, W. Nutritional epidemiology. 3rd ed. New York: Oxford University Press, 2013. p. 305-333. Available at: https://books.google.com.br/books?hl=pt-BR&lr=&id=UKs3VaEtNukC&oi=fnd&pg=PP2&dq=Nutritional+epidemiology&ots=xwNjYk0_yv&sig=l6kwj13SYIpfkIS47ZjGX-aBao4&redir_esc=y#v=onepage&q=Nutritional%20epidemiology&f=false. Accessed on: Feb. 1, 2025.

WORLD HEALTH ORGANIZATION. **Noncommunicable diseases**. Geneva: WHO, 2018. Available at: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases. Accessed on: Oct. 10, 2024.

WORLD HEALTH ORGANIZATION. **Preventing chronic diseases: a vital**

REMUNOM
ISSN 2178-6925

Received: 13/01/2026 - **Accepted:** 08/03/2026
Vol: 13.02
DOI: 10.66104/mqr9dj86
Pages: 1-21

investment. Geneva: WHO, 2005. Part Two. Available at: https://www3.paho.org/hq/dmdocuments/2012/WHO-Preventing-NCDs-2005-Eng.pdf. Accessed on: Oct. 10, 2024.

XU, Y. *et al*. Comparison of the diet photograph record to weighed dietary record and 24 h dietary recall for estimating energy and nutrient intakes among Chinese preschoolers. **Frontiers in Nutrition**, Lausanne, v. 8, p. 755683, 2021. Available at: https://www.frontiersin.org/journals/nutrition/articles/10.3389/fnut.2021.755683/full . Accessed on: July 29, 2025.

ZHANG, B. *et al.* Global burden of cardiovascular disease from 1990 to 2019 attributable to dietary factors. **The Journal of Nutrition**, v. 153, n. 6, p. 1730-1741, Jun. 2023. Available at: https://www.sciencedirect.com/science/article/pii/S0022316623355044. Accessed on: Mar. 2, 2024.