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Adaptation and validation of a questionnaire for assessing practices toward salt and sodium in Brazilian adolescents and young adults

Adaptação e validação de questionário para avaliação de práticas relacionadas ao sal e sódio em adolescentes e jovens adultos brasileiros

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ABSTRACT

Objective

This study aimed to adapt and validate an online instrument assessing Brazilian adolescents' and young adults' practices regarding salt and sodium.

Methods

Based on a developed questionnaire for adults, nine experts evaluated new items, generating item and scale-level content validity indexes, with acceptable cut-off point of 0.8. Face validity (n=20) and reliability analysis (kappa) (n=30) were assessed. Items were excluded if kappa <0.5. Exploratory factor analysis was used to determine the construct validity. Items with factor loadings <|0.3| were considered non-significant and excluded. Cronbach's α was calculated to assess internal structure, using data collected from a convenience sample (n=345). Coefficient values ≥ 0.7 were considered satisfactory. Generated solutions were analyzed from theoretical and statistical significance perspectives to achieve the best model.

Results

Item-level content validity index (0.78-1), scale-level content validity index (0.96-0.99) and kappa values (97% of items with kappa >0.5) demonstrated that items are adequate for application. The final model in the exploratory factor analysis sufficiently explained data variance with good internal structure (Cronbach's $\alpha=0.79$; 95% CI 0.75-0.82). The valid questionnaire has two dimensions – one related to behavioral practices (8 items), and another to dietary markers (13 items).

Conclusion

This instrument is ready to be applied and easily reproduced, contributing to assessing practices toward salt and sodium in Brazilian youngsters.

Keywords: Adolescent behavior. Nutrition public health. Sodium chloride, dietary. Validation study.



RESUMO

Objetivo

Este estudo teve como objetivo adaptar e validar um instrumento online para avaliar práticas de adolescentes e jovens adultos brasileiros em relação ao sal e sódio.

Métodos

A partir de um questionário desenvolvido para adultos, novos itens foram avaliados por nove juízes, gerando índices de validade de conteúdo em nível de item e escala, com ponto de corte em 0,8. A validade aparente ($n=20$) e a análise de confiabilidade ($kappa$) ($n=30$) foram avaliados. Itens com $kappa < 0,5$ foram excluídos. Análise fatorial exploratória foi utilizada para determinar a validade de construto. Itens com carga fatorial $< |0,3|$ foram considerados não significativos, e, portanto, foram excluídos. O α de Cronbach foi calculado para analisar a estrutura interna, usando dados coletados de uma amostra de conveniência ($n=345$). Coeficientes com valores $\geq 0,7$ foram considerados satisfatórios. As soluções geradas foram analisadas a partir de perspectivas teórica e de significância estatística, que subsidiaram a determinação do melhor modelo.

Resultados

Índice de validade de conteúdo em nível de item (0,78-1), índice de validade de conteúdo em nível de escala (0,96-0,99) e valores de $kappa$ (97% dos itens com $kappa > 0,5$) demonstraram que os itens estão adequados para aplicação. O modelo final na análise fatorial exploratória explicou suficientemente a variância dos dados, com boa estrutura interna (α de Cronbach=0,79; IC 95%: 0,75-0,82). O questionário validado contempla duas dimensões – uma relacionada a práticas comportamentais (8 itens) e outra relacionada a marcadores dietéticos (13 itens).

Conclusão

Este instrumento está pronto para ser aplicado e apresenta fácil reprodução, contribuindo para a avaliação de práticas relacionadas ao sal e sódio em jovens brasileiros.

Palavras-chave: Comportamento do adolescente. Nutrição em saúde pública. Cloreto de sódio na dieta. Estudo de validação.

INTRODUCTION

Cardiovascular diseases cause premature morbidity and contribute significantly to mortality rates globally, accounting for 17.8 million deaths annually [1]. High blood pressure is the leading modifiable risk factor for attributable premature cardiovascular deaths in the world, being responsible for more than 10 million cardiovascular deaths in 2021 [2]. A strong dose-response association between sodium intake and blood pressure is already well established for adults in current literature [3]. For children and adolescents, it was recently suggested that for every additional gram of sodium intake per day, there is an increase in systolic blood pressure by 0.8 mmHg (95% CI: 0.4, 1.3) and in diastolic blood pressure by 0.7 mmHg (95% CI: 0.0, 1.4) [4]. In addition, significant tracking correlations between childhood and adulthood blood pressure measurements and subclinical cardiovascular outcomes in adults were described [5,6], highlighting the need to adopt low-sodium diets from the early stages of life.

Even though there is no consensus for adequate sodium intake for school-aged children and adolescents, recommendations generally indicate lifelong benefits for consumption < 2000 mg/day [7,8]. Global estimates show much higher intake means/medians for sodium intake compared to recommendations [9–13]. In Brazil, an average intake of 3520 mg/day (95% CI: 3420–3630) was found for adolescents aged 10–19 years [14,15], with more than 80% higher than the tolerable upper intake level [16]. Similarly, Brazilian adults show an average salt intake of 9.34 g/day (95% CI: 9.27, 9.41) [17], twice the recommended amount [7], with 61% exceeding intake of more than 2300 mg/day [18]. Consequently, in 2017, an estimated 46,651 deaths were associated with excessive salt consumption, resulting in 575,172 Years of Life Lost and US\$ 752.7 million in productivity losses to the economy [19]. The main dietary sources of sodium in Brazil correspond to discretionary salt and

salt-based condiments (74%), added to food during cooking, and processed foods with added salt (19%) [20]. It was found that white rice and beans, a staple combination in Brazilian cuisine, could represent almost 22% of sodium intake for adults, due to discretionary salt addition [18].

Since youngsters are exposed to high sodium meals prepared at home, a palate adaptation could be developed and a preference for high-sodium foods might occur. Hyper palatable foods, i.e. foods with exacerbated flavor developed to induce consumption by hedonic reasons, mainly ultra-processed, are relevant energy-dense sources of sodium, sugar and fats; and highly contribute to the burden of premature cardiovascular outcomes in Brazil [21,22]. A longitudinal study in Brazil, following children from birth until 12 years of age, showed that sodium intake from ultra-processed foods increased from 1 to 4 years ($p < 0.01$), while unprocessed foods decreased during the same period ($p = 0.02$) [23]. Another study with Brazilian children with obesity aged 7–12 years showed significant correlations between the intake of ultra-processed foods in grams and dietary and urinary sodium/potassium ratios ($r = 0.40$, $p < 0.001$ and $r = 0.29$, $p < 0.008$, respectively). Moreover, it was found that for every 100 g increase in ultra-processed foods intake, diastolic blood pressure increased by 0.28 mmHg ($p = 0.01$) [24]. Importantly, new evidence shows that sodium/potassium ratio and sodium excretion are positively associated with the incidence of hypertension in young adults (p trend < 0.05) [25]. Therefore, efforts to reduce sodium intake in this age group should be made [26].

Consumer awareness is key to achieve a reduction in sodium intake, considered one of the most effective interventions to prevent and control noncommunicable diseases [27,28], at the same time, cultural differences and audience segmentation should be considered to design effective public health interventions to reduce sodium intake in Latin-America [29]. Screener tools on practices towards sodium can help generate up-to-date evidence on individual's beliefs, supporting the development of educational campaigns [29,30]. Since an individual's level of engagement in behaviors associated with positive health outcomes is shaped by cognitive, motivational, and psychosocial factors, singularities between age groups should be considered when developing and validating dietary-related tools [31]. Social media, value of food, appeal of food, and emotional connections seems to be relevant factors to make food choices among younger audiences [32–34], not necessarily as much among mature adults. Most questionnaires on Knowledge, Perceptions and Behaviors (KPB) towards salt/sodium available were designed to be applied in populations living in high-income countries and targeted at mature adults [35–37].

Recently a new questionnaire to assess KPB towards salt and sodium among Brazilian adults (20–59 years old) was developed and thought to be applied by telephone interviewing in population-based studies [38]. Even though telephone interviewing has some advantages as described by the authors, such as lower costs and better research management, it can be expected that response rates might be lower when recruiting younger audiences. Therefore, web surveys offer convenience, low costs, time efficiency and reduces the risk of errors, since participants self-register their own responses [39]. Considering no questionnaire was developed to assess KPB related to salt and sodium among adolescents and young adults in Brazil, this work unprecedentedly described the adaptation of an adult-valid questionnaire to assess KPB toward salt and sodium among youngsters in Brazil.

METHODS

Study design

This cross-sectional validation study adapted an adult-valid questionnaire to assess KPB toward salt and sodium among young Brazilians [40,41]. All data collection was performed using the

Google Forms platform (online). Ethical approval was obtained from the human Ethics Committee at the University of Campinas (CAAE: 30650320.5.0000.5404). Participants aged 18 years or older signed electronically the consent form. For those participants under 18 years, an assent form was electronically signed, in addition to the consent form signed by one of the primary caregivers (usually parents). The adult-valid questionnaire had the scope to assess practices toward salt and sodium. This scope remained relevant to the adapted tool; hence, validation and reliability analysis were carried out as follows.

Content validity

Nine Brazilian professionals involved in scientific productions related to salt and/or sodium intake (e.g. sodium reduction in processed food, epidemiology of non-communicable diseases) were invited to join an expert's panel, from August to September 2020. Experts were asked to assess the item's effective ability to represent the interest construct (practices toward salt and sodium among youth in Brazil), and whether the terms and language used, including the form of writing and wording presented, would be easily understood by the target audience [42]. In this study, the content of knowledge and behaviors related to sodium consumption were the same as those assessed in the questionnaire of Gomes et al. [38]. However, considering the target audience, the wording of these dimensions was adapted to a less technical language, and the approach to some aspects was more indirect, considering that in this age group, much of the diet is still controlled, influenced, or perceived by parents [31,43]. For example, it is known that few adolescents take responsibility for preparing/cooking their own diet. Therefore, instead of asking about the cooking methods used by the young person (if they use healthy foods and ingredients) as in the original questionnaire, it was asked whether they consume these items. Furthermore, to facilitate the self-assessment of the young person, in the food consumption dimension of the questionnaire, instead of approaching major food groups in a single question, such as "How many days of the week do you usually eat some type of sausage, hot dog sausage, ham, mortadella, bacon, or other salt-cured meats?" as in the original questionnaire, these items were disaggregated into individual questions, and new food items were added (Mozzarella, salty biscuit, instant noodles, powdered or cup soup). In general, the inclusion criteria for the new food items were: expected high consumption for the Brazilian population, especially for young people, and being products with a salty taste and high sodium concentration [44–47]. In addition, questions regarding salt/calories/sugar/fat intake control and habits of reading nutritional labels were similar in both questionnaires. However, in the adapted version, we considered the general habit instead of the frequency in the past 30 days.

Each item was scored from one to four for representativeness, scope, clarity, and response options, with scores of three and four validating the item. Item Content Validity Index (I-CVI) was calculated by dividing the number of experts who scored 3 or 4 by the total number of experts [42]. Scale-level content validity index (S-CVI) was also calculated, dividing the sum of all I-CVIs by the total number of items. In addition, experts provided suggestions/comments regarding each question.

Face validity

A convenience sample of 20 adolescents and young adults in Brazil (11 undergraduates) participated at this stage, from September to November 2020. The participants were students from the state of São Paulo invited through the social networks of the University of Campinas (mainly WhatsApp groups and institutional emails sent to participants or their parents). Firstly, they self-

completed each questionnaire section and freely answered: “Did you face any difficulty to understand any question of this section? If yes, indicate which question and why”; “Is there something that you consume regarding salty processed foods or salt added directly to food that was not covered in the questionnaire?”; “Did you feel uncomfortable answering any of these questions? If yes, why?”; and “Would you answer this questionnaire again? If not, why?”. These answers were used to improve the clarity and coverage of the instrument.

Reliability analysis

The reliability of the instrument was determined based on its overall internal consistency and reproducibility. To do so, test-retest (15-day interval) was carried out with a convenience sample of 30 respondents (16 females, 25 undergraduates), selected as described in “Face validity” section. Answers were used to calculate kappa-coefficient (items with nominal scale) or quadratic weighted kappa (items with ordinal scale). Items with kappa <0.5 were excluded [48].

Construct validity and internal structure

This step aimed to identify the dimensionality of the construct “practices toward salt and sodium” (latent variable), and the extent to which the set of items was correlated to this component (observed variables) [48,49]. From May to June 2021, participants aged 14–24 years old were recruited through personal contact (WhatsApp) and social media platforms (Instagram). Once they enrolled in the study, they were stimulated to spread the message with a questionnaire link to other contacts (adapted snowball sampling).

Exploratory Factor Analysis (EFA) was performed since there was no previous hypothesis regarding the number of latent variables represented by the questionnaire. A convenience sample of 345 youngsters was considered appropriate, since it overcame the literature recommendation of a minimum of ten observations per variable [48]. The Kaiser–Guttman criterion was adopted to determine the number of factors to be extracted (eigenvalue >1.00) [48]. Since items do not have equal responses categories, scores were given as continuum data. Generated solutions were analyzed from theoretical and statistical significance perspectives to achieve the best model. Items with factor loadings <0.3 were considered non-significant and excluded. Cronbach’s α coefficient assessed the internal structure of the questionnaire. Coefficient values ≥ 0.7 were considered satisfactory [50]. Construct validity analyses were conducted on R-software, and all others were performed on software Stata 16.0 S.E.

RESULTS

Content and face validity

Experts evaluated most items and answering options as representative, within the scope and clear (CVI >0.8) (Table 1), and S-CVI ranged between 0.96–0.99. Only one item was scored with CVI marginally <0.8 for representativeness, scope, and clarity (“Generally, when you eat food prepared by someone else, you usually notice that food has: Low salt/ Salt in the ideal concentration/ Too much salt”). Nevertheless, we opted to keep this question to assess possible difficulties through the repeatability test.

Table 1 – Items, sub-items and response options in English, and items' content validity indexes, kappa values and factor loadings for initial and final solutions.

Item and responses	Sub-items	CVI-r	CVI-s	CVI-c	CVI-ro	Kappa	FL-I D1	FL-I D2	FL-F D1	FL-F D2
Considering your eating habits in the past month, how often did you eat ready/semi-ready or frozen dishes (on-site, for pick-up or delivery): Never/almost never; once a month; every 15 days; weekly; daily.	-	1.0	0.89	1.0	0.89	0.67	-	0.32	-	0.30
Generally, when you eat food prepared by someone else, you usually notice that food has: Low salt; Salt in the ideal concentration; Too much salt.	-	0.78	0.78	0.78	0.89	0.72	-	-	-	-
In your opinion, how much salt do you think you consume daily?: Low salt; Salt in the ideal concentration; Too much salt.	-	1.0	1.0	1.0	0.89	0.65	-	-	-	-
What is the salt limit established by health agencies as safe for daily consumption? 2g; 5g; 8g; 10g; There is no limit; There is a limit, but I cannot say how much.	-	0.89	0.89	0.89	0.89	0.69	-	-	-	-
For each following question, note how often do you: Never/almost never; monthly/once a month; every 15 days; weekly; daily.	Add salt to the ready-to-eat dish?	0.89	1.0	1.0	1.0	0.84	-	-	-	-
	Use processed seasoning (tablets or powders) to cook?	0.89	1.0	1.0	1.0	0.81	-	0.33	-	0.31
	Control the amount of salt ingested?	0.89	1.0	1.0	1.0	0.92	0.59	-	0.60	-
	Control the amount of fat ingested?	0.89	1.0	1.0	1.0	0.90	0.76	-	0.81	-
	Control the amount of sugar ingested?	0.89	1.0	1.0	1.0	0.77	0.76	-	0.78	-
	Control the total calories ingested?	0.89	1.0	1.0	1.0	0.71	0.60	-	0.62	-
	Read nutritional information and list of ingredients in processed food.	0.89	1.0	1.0	1.0	0.76	0.40	-	0.40	-
Indicate the frequency of consumption of these foods: Less than once a month; once a month; twice a month; once a week; more than once a week	Packaged snack	1.0	1.0	1.0	1.0	0.83	-	0.33	-	0.30
	Salty biscuit	1.0	1.0	1.0	1.0	0.83	-	0.34	-	0.35
	Mozzarella cheese	1.0	1.0	1.0	1.0	0.68	-	0.44	-	0.41
	Instant noodles	1.0	1.0	1.0	1.0	0.86	-	-	-	-
	Mortadella	1.0	1.0	1.0	1.0	0.80	-	0.43	-	0.46
	Ham	1.0	1.0	1.0	1.0	0.78	-	0.57	-	0.59
	Salami	1.0	1.0	1.0	1.0	0.73	-	0.38	-	0.37
	Turkey breast	1.0	1.0	1.0	1.0	0.78	-	-	-	-
	Hot-dog sausage	1.0	1.0	1.0	1.0	0.80	-	0.57	-	0.60
	Bacon	1.0	1.0	1.0	1.0	0.64	-	0.45	-	0.45
	Fresh sausage	1.0	1.0	1.0	1.0	0.70	-	0.53	-	0.56
	Frozen hamburger	1.0	1.0	1.0	1.0	0.85	-	0.42	-	0.43
	"Nuggets" (Frozen breaded chicken)	1.0	1.0	1.0	1.0	0.70	-	0.52	-	0.50
Frozen kibe (pre-fried meatballs)	1.0	1.0	1.0	1.0	0.41	---	---	---	---	
Powdered or cup soup	1.0	1.0	1.0	1.0	0.92	-	-	-	-	
In general, do your family members, doctors, and/or nutritionists consider your diet healthy?: Always; Frequently/Most of time; Rarely; Never; I do not know.	-	0.89	0.89	1.0	1.0	0.64	-0.50	-	-0.46	-
In general, how do you rate your diet?: Very healthy; Healthy; Regular; Unhealthy/ Very unhealthy.	-	1.0	1.0	1.0	0.89	0.80	-0.53	-	-0.50	-
In general, how do you rate your health?: Very good; Good; Regular; Bad; Too bad	-	1.0	1.0	1.0	0.89	0.77	-0.38	-	-0.35	-
Scale-level Content Validity Index		0.96	0.98	0.99	0.98					

Note: CVI-r: Item Content Validity Index for representativeness. CVI-s: Item Content Validity Index for scope. CVI-c: Item Content Validity Index for clarity. CVI-ro: Item Content Validity Index for response options. FL-I D1 & D2: Significant factor loadings related to dimension 1 & 2 in the Initial solution. FL-F D1 & D2: Significant factor loadings related to dimension 1 & 2 in the Final solution. Non-significant factor loadings represented by "--".

Participants faced no difficulties answering questions about face validity, except "Considering your eating habits in the past month, how often did you eat ready/semi-ready or frozen dishes (on site, for pick-up or delivery)". Participants demonstrated uncertainty whether they should have considered their habits pre or during the COVID-19 pandemic, since they acknowledged changes in their eating habits due to the pandemic. To solve this problem, a time-period orientation ("in the past month...") was included. Moreover, 95% of participants did not mention any other salty

food item that was not already covered in the questionnaire. All respondents reported that they were not bothered by any question, and would answer the questionnaire again, if asked. Finally, the time estimation to complete the questionnaire by the target population was 8 min, which was considered feasible by participants.

Reliability

Most items (97%) reached kappa >0.5, showing a substantial concordance in test-retest, as shown in Table 1. Only one item referring to the intake of “Frozen kibe” (pre-fried meatballs) was excluded (kappa=0.41).

Construct validity and internal structure

Sample characteristics are described in Table 2. Tests confirmed sampling adequacy to perform the EFA (KMO=0.74; Bartlett’s sphericity test, $p<0.001$). Two factors with eigenvalues >1.00 were identified in the scree plot. In the EFA (Table 1), an initial two-factor solution returned eight significant items related to the first dimension, and 13 variables related to a second dimension. After excluding non-significant items, the final solution explained 27% of the variance, with the first dimension explaining 14% and the second, 13%. Cronbach’s α was equal to 0.79 (95% CI 0.75-0.82), indicating good internal structure. The final instrument developed (both in Brazilian Portuguese and in English versions) is shown in Chart 1.

Table 2 – Sample characteristics (n=345).

Variable	n	%
Sex		
Male	114	33.0
Female	229	66.4
No answer	2	0.6
Age (years)		
14-18	95	27.5
19-21	153	44.3
22-24	97	28.1
Education		
Up until complete high school	99	28.7
More than complete high school	246	71.3
Family revenue		
<R\$3100	75	21.7
R\$ 3.100-R\$ 9.300	159	46.0
>R\$ 9.300	111	32.2
Disease diagnosis*		
At least one diagnosis	24	7.0
None / None of the above	321	93.0
Who do you live with		
Parents and/or siblings	292	84.6
Parents and/or siblings + other people	18	5.2
Other people or alone	35	10.1

Note: *Diagnosis considered: High triglycerides, cholesterol, blood pressure; diabetes; cancer; kidney and cardiovascular diseases; obesity.

Chart 1 – Final questionnaire in Brazilian Portuguese and English.

Pergunta / Question	Itens / Items	Opções de resposta / Answer options
DIMENSÃO 1 – 8 ITENS (1 até 8) / DIMENSION 1 – 8 ITEMS (1 to 8)		
1-5. <i>Para cada pergunta, aponte a frequência com que você: / For each following question, note how often do you:</i>	1. <i>Controla a quantidade de gordura ingerida? / Control the amount of fat ingested?</i> 2. <i>Controla a quantidade de açúcar ingerida? / Control the amount of sugar ingested?</i> 3. <i>Controla o total de calorias ingeridas? / Control the total calories ingested?</i> 4. <i>Controla a quantidade de sal ingerida? / Control the amount of salt ingested?</i> 5. <i>Lê informações nutricionais e ingredientes de produtos embalados? / Read nutritional information and list of ingredients in processed food?</i>	a) <i>Diariamente / Daily</i> b) <i>Semanalmente / Weekly</i> c) <i>A cada 15 dias / Every 15 days</i> d) <i>Mensalmente / Monthly</i> e) <i>Nunca/ quase nunca / Never/almost never</i>
6. <i>Em geral, como você avalia a sua alimentação? / In general, how do you rate your diet?</i>		a) <i>Muito saudável / Very healthy</i> b) <i>Saudável / Healthy</i> c) <i>Regular / Regular</i> d) <i>Pouco saudável/Muito pouco saudável / Unhealthy / Very unhealthy</i>
7. <i>Em geral, seus familiares, médicos e/ou nutricionistas consideram sua alimentação como saudável? / In general, do your family members, doctors, and/or nutritionists consider your diet healthy?</i>		a) <i>Sempre / Always</i> b) <i>Frequentemente/ Às vezes / Frequently/Most of time</i> c) <i>Raramente / Rarely</i> d) <i>Nunca / Never</i> e) <i>Não sei dizer / I do not know</i>
8. <i>Em geral, como você avalia sua saúde? / In general, how do you rate your health?</i>		a) <i>Muito boa / Very good</i> b) <i>Boa / Good</i> c) <i>Regular / Regular</i> d) <i>Ruim/Muito Ruim / Bad/ Too bad</i>
DIMENSÃO 2 – 13 ITENS (9 até 21) / DIMENSION 2 – 13 ITEMS (9 to 21)		
9. <i>Considerando sua rotina de alimentação no último mês (comendo no local, para retirada ou delivery), com que frequência você se alimentou com/em: / Considering your eating habits in the past month (on-site, for pick-up or delivery), how often did you eat</i>	9. <i>Comida pronta/semipronta ou congelada / Ready/semi-ready or frozen dishes</i>	a) <i>Nunca/ Quase nunca / Never/Almost never</i> b) <i>1x ao mês / Once a month</i> c) <i>A cada 15 dias / Every 15 days</i> d) <i>Semanalmente / Weekly</i> e) <i>Diariamente / Daily</i>
10. <i>Para cada pergunta, aponte a frequência com que você: / For each following question, note how often do you:</i>	10. <i>Usa tempero pronto (tabletes ou pós) para preparar comida / Use processed seasoning (tablets or powders) to cook?</i>	a) <i>Diariamente / Daily</i> b) <i>Semanalmente / Weekly</i> c) <i>A cada 15 dias / Every 15 days</i> d) <i>1x por mês / Once a month</i> e) <i>Nunca/ Quase nunca / Never/almost never</i>
11-21. <i>Indique a frequência de consumo desses alimentos: / Indicate the frequency of consumption of these foods:</i>	11. <i>Salgadinho de pacote / Packaged snack</i> 12. <i>Biscoito Salgado / Salty biscuit</i> 13. <i>Queijo Muçarela / Mozzarella cheese</i> 14. <i>Mortadela / Mortadella</i> 15. <i>Presunto / Ham</i> 16. <i>Salame / Salami</i> 17. <i>Salsicha / Hot-dog sausage</i> 18. <i>Bacon / Bacon</i> 19. <i>Linguiça / Fresh sausage</i> 20. <i>Hambúrguer congelado / Frozen hamburger</i> 21. <i>Empanados de frango congelados tipo “Nuggets” / “Nuggets” (Frozen breaded chicken)</i>	a) <i>Mais que 1x por semana / More than once a week</i> b) <i>1x por semana / Once a week</i> c) <i>2x por mês / Twice a month</i> d) <i>1x por mês / Once a month</i> e) <i>Menos que 1x por mês / Less than once a month</i>

DISCUSSION

This is the first valid instrument to assess practices toward salt and sodium in Brazilian adolescents and young adults (14–24 years old), designed to be applied in public health studies. We conducted a careful step-by-step process to assess several types of validities, in addition to reliability and internal structure analyses of the questionnaire. Results from content and face validities showed that items were relevant to the scope of the questionnaire, in addition to having clarity and being easy to answer. Reliability analysis demonstrated the reproducibility, with a good internal structure of the questionnaire and sufficiently explaining the variance. This tool can be easily reproduced through online platforms, and can help generate relevant data related to sodium intake, providing evidence for developing nutrition-related interventions. Items covered in this questionnaire are related to food items that have a great impact on sodium intake for this age group, such as processed meat

(e.g. ham, mortadella), and another in regards to health-related behaviors and perceptions (e.g. controlling the intake of salt, self-assessment of diet healthiness). Having both dimensions in one questionnaire can contribute to the assessment of different knowledge, perceptions and behaviors that, as a whole, may contribute to excess intake.

Screening tools related to sodium intake have been developed around the world with distinct scopes than the one developed in this study. For example, a web-based questionnaire able to assess long-term sodium intake for Canadians aged 4 years and older covers food items that are relevant sources of sodium in Canada, e.g. meals eaten at table-service or fast-foods restaurants [35]. Another example is a 42-item food frequency questionnaire able to assess habitual dietary salt intake in South Africans, enabling the classification of individuals into categories of intake [36]. Although the developed tool does not quantify the amount of sodium one consumes, it can give relevant insights into practices associated with excess intake. For instance, studies demonstrated that using nutritional information available on package labels can assist even young consumers to make healthier choices [51]. In this study, reading the nutrition facts table and the list of ingredients showed significant factor loading to the health-related behaviors and perceptions dimension in the EFA. These results reassures the need for sustainable initiatives to guarantee easy access and better comprehension of nutrition information, such as new regulations related to front-of-package food labelling already in place in Brazil [52]. Having warning labels highlighting that a product is “high in” sodium can help consumers of all ages to make informed decisions.

The choice of adapting an instrument thought to be applied among Brazilian adults and already available in Brazilian Portuguese helped identify which questions should be relevant when considering the national context, as it was confirmed by the results from the experts’ panel. This fact may be due to great similarity in two factors: language and dietary habits. As per guidelines for the conduction of translation and cross-cultural adaptation studies, careless translations can lead to relevant misconceptions affecting overall comprehension of questions, and even if items are correctly translated, challenges regarding cultural barriers might influence results [53,54]. One example related to sodium intake is that approximately 75% of consumers in the Americas do not know the difference between salt and sodium [55], which can influence the ability to answer questions regarding this topic. Therefore, testing whether experts and participants had comments regarding the clarity and scope of items was key to ensuring validity. Regarding dietary markers, it was expected that both Brazilian mature adults and youth had similarities in relevant sources, however, experts suggested adding two items (salty biscuit and Mozzarella cheese). Interestingly, a Mexican screening tool for sodium intake based on a Canadian food-frequency questionnaire has more food items related to home-style meals compared to the Canadian one, since ethnic dishes represent relevant sources of sodium in their context [56]. Finally, current literature demonstrates that there are many challenges considering studies with younger samples and avoiding study abandonment is key [57]. Ensuring that participants were not bothered at the end of the questionnaire, and the method of data collection was appropriate, enabled the research to be conducted as planned. Part of this study was conducted during the COVID-19 pandemic, which influenced how participants considered their “habitual” behaviors.

There are limitations of this study that must be addressed and considered in future research. Results from this questionnaire were not compared to actual sodium intake (convergent validity). Although convenience samples were sufficient to perform validation analyses, they may not represent all variability present in Brazilian adolescents and young adults, in addition to the fact that we only considered adolescents in the second and third phases of adolescence (14–19 years old). Therefore,

more diverse and national representative data is necessary to assess the questionnaire psychometrics properties further. Finally, for all age groups, further research on barriers and facilitators on sodium reduction in Brazil should complement results from practices related to salt and sodium covered by this questionnaire, aiming to provide enough scientific evidence to inform public health decisions.

CONCLUSION

The developed instrument proved valid and capable of assessing practices toward salt and sodium in Brazilian adolescents and young adults, as content, face and construct validities were successfully assessed, with good reliability. In addition, results from this study provide evidence of its easy application through online platforms, both for research personnel and participants. Data from this questionnaire may contribute to developing evidence-based interventions aiming to reduce sodium intake among Brazilians adolescents and young adults.

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