

## Original Article

# Cultural adaptation and psychometric properties of social cognitive scales related to adolescent dietary behaviors

## Adaptação cultural e propriedades psicométricas das escalas sociais cognitivas relacionadas ao comportamento dietético de adolescentes

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### Abstract

Establishing valid and reliable methods for assessing social cognitive measures of dietary behaviors support the design and delivery of more effective interventions. The aims of this study were to culturally adapt social cognitive measures related to adolescent dietary behaviors and evaluate the reliability and factorial validity of these measures in Brazilian adolescents. The instrument was culturally adapted from an Australian questionnaire based on the Banduras' Social Cognitive Theory, and it included the following constructs: self-efficacy, intentions, situation, social support, behavioral strategies, and outcome expectations and expectancies. The questionnaire was administered in a two-week test-retest with 173 adolescents (M=15.3±1.53 years old). A confirmatory factor analysis was employed to examine model-fit for each scale using multiple indices including: chi-square, comparative-fit, goodness-of-fit, and root mean square error of approximation. Reliability properties were also examined. The reliability and factorial validity are appropriate, suggesting for each scale values between adequate to exact; internal consistency from acceptable to excellent ( $\alpha=0.66$  to 0.94); and rank order repeatability from adequate to strong (ICC=0.65–0.93). The Brazilian version showed appropriate internal consistency, factorial validity and test-retest reliability, and will be useful to assess social cognitive dietary behaviors among Brazilian adolescents.

**Keywords:** adolescents; feeding behavior; measures; validation studies.

### Resumo

O estabelecimento de métodos validados e confiáveis para avaliar os aspectos sociais cognitivos do comportamento dietético suportam o delineamento e o desenvolvimento de intervenções mais efetivas. Os objetivos deste estudo foram adaptar um instrumento que avalia os aspectos sociais cognitivos do comportamento dietético, bem como a sua confiabilidade e validade fatorial confirmatória em adolescentes brasileiros. O instrumento foi culturalmente adaptado de um questionário australiano baseado na Teoria Cognitiva Social de Bandura, que incluiu os seguintes construtos: autoeficácia, intenções, situação, apoio social, estratégias comportamentais, expectativas e preditores de expectativas. O questionário foi administrado com duas semanas de teste-reteste em 173 adolescentes (M=15,3±1,53 anos). A análise confirmatória fatorial foi empregada para examinar o modelo de ajuste para cada escala utilizando múltiplos índices que incluíam: qui-quadrado, *comparative-fit* (CFI), *goodness-of-fit* (GFI) e o *root mean square error of approximation* (RMSEA). As propriedades de confiabilidade também foram avaliadas. A validade fatorial e confiabilidade estão adequadas, sugerindo para cada escala valores entre adequado a exato; consistência interna de aceitável à excelente ( $\alpha=0,66$  a 0,94) e repetitividade da ordem de classificação de adequada à forte (ICC=0,65 a 0,93). A versão brasileira apresentou consistência interna, validade fatorial e confiabilidade do teste-reteste aceitáveis, e poderá ser útil para avaliar os aspectos sociais cognitivos dos comportamentos dietéticos dos adolescentes brasileiros.

**Palavras-chave:** adolescentes; comportamento alimentar; medidas; estudos de validação.

Study carried out at the School of Public Health, Universidade de São Paulo (USP) and in Public schools in São Paulo – São Paulo (SP), Brazil.

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## INTRODUCTION

Evidence suggest that health behavior theories, like the Social Cognitive Theory (SCT), or the Theory of Planned Behavior, are helpful for interpreting adolescents' dietary behaviors<sup>1</sup>. Theoretically, based-interventions are more effective in changing behavior than non-theoretical approaches<sup>1-4</sup>. Bandura's SCT<sup>5</sup> is a useful framework for explaining why people acquire and maintain health behaviors, as well as to hypothesize that a behavior change is influenced by a complex interaction referred to as "reciprocal determinism", which occurs between personal factors, environmental factors, and factors influenced by the other's behavior<sup>5,6</sup>.

The use of social cognitive measures related to dietary behaviors with good psychometric properties applied to interventions allows for the development and refinement of theory, as well to support the design and deliver interventions that are more effective. However, interventions conducted in developing countries<sup>7-10</sup> including Brazil that target dietary behaviors rarely assess the theoretical mechanisms of dietary behavior change. Such studies generally use food frequency questionnaires and dietary recalls to assess the dietary behavior change. Moreover, few research investigating social cognitive mechanisms of dietary behavior in youth have been compounded by the use of mediator measures with adequate-good psychometric properties<sup>1</sup>.

An Australian questionnaire concerning adolescent dietary behaviors is an important published and validated survey that was based on constructs from Bandura's SCT and included the main scales: self-efficacy, intentions (proximal goals), situation (perceived environment), social support (family and friends), behavioral strategies, outcome expectations, and expectancies. The reliability and factorial validity of each scale is supported: fit indices suggest each model to have an adequate to exact fit to the data; internal consistency was acceptable to good ( $\alpha=0.65-0.79$ ); and rank order repeatability was strong (ICC=0.81-0.89). The developed scales have the aim of identifying potential social cognitive correlates of adolescent behavior, mediators of dietary behavior change, and validity testing of theoretical models based on the SCT<sup>11</sup>.

Since the scales were developed and evaluated in English directed to the Australian culture, it is important to evaluate its psychometric properties in other languages, as well as other cultures in order to perform comparative studies in different countries, cultures, groups, ethnicities, age groups or clinical populations. The objective of this study was to culturally adjust the social cognitive scales from English to Portuguese language, and to assess its internal consistency, factorial validity and test-retest reliability.

## METHODS

### Procedures

In order to ensure translation accuracy, two dietitians fluent both in English and in Portuguese independently translated the English version of the "Social Cognitive Scales related to adolescents' dietary behaviors" into Portuguese. Then, it was compared and reconciled with each other, also by an English as a second language instructor to create the first version of the scales. Later on, another dietitian with the same mentioned characteristics back translated this version to English and compared with the original version. No discrepancies were found. Next, a specialist panel comprising nine experts in the area of nutrition, SCT, and/or scale cultural adaptation were consulted to review and improve the preliminary version and create the final one, which was than administered to 173 adolescents and again to a subgroup (n=22) two-weeks later to assess test-retest reliability.

### Social cognitive questionnaire related to adolescents' dietary behaviors

The questionnaire comprises seven scales based on the Bandura's SCT<sup>6</sup>. To increase scale sensitivity, the number of Likert-type response options employed by each scale used no less than four options of answers<sup>12</sup>. No neutral/uncertain response category was provided for any scale on the basis that this may lower questionnaire reliability through reducing variability<sup>12</sup>. As such, scales ensured the provision of weak response categories (e.g., totally agree, partially agree, agree) to attract students who would otherwise prefer a neutral option. The original scale was developed and validated with Australian adolescents from low-income communities in the Hunter and Central Coast region, New South Wales, Australia and the internal consistency found for each scale ranged from 0.65 to 0.79. An exploratory factor analysis confirmed the seven scales. The scales in English were found in the article about its development and evaluation<sup>11</sup>.

### Participants

For the Brazilian version, subjects who were studying in the seventh year of elementary school until the third year of high school, from both genders (n=173, 56.1% male), aged 12 to 19 from public schools, were included. Schools from different low-income areas of the city of São Paulo were selected. Participants were contacted through the principal's telephone and/or e-mail of each school in order to get the authorization for this study. Next, the groups of students were invited to participate in person during class through their schools principals and/or teachers. Students were given

the questionnaire/scales and a brief explanation about the study and that their choice to participate would not negatively affect their grade in class. They answered the survey during class, which also included demographics information such as, age, ethnicity, home postcode and parents'/caregivers highest level of education. Food and beverages intake were also assessed through a validated 50-item food frequency questionnaire for adolescents<sup>13</sup> and classified according to the Brazilian Food Guide Pyramid groups<sup>14</sup>.

### Measures

**Self-efficacy:** for the five-item self-efficacy scale, respondents were asked to rate their confidence in personal ability to choose/eat healthy foods whenever a choice is provided using a six-point Likert-type scale (1 = totally disagree; 6 = totally agree), e.g., "I find it difficult to choose foods reduced in fat" like fried preparations instead of baked, cooked and grilled.

**Intentions:** using a four-point Likert-type scale (1 = not all totally true for me; 4 = very true for me), five items assessed their intentions to adopt healthy eating behaviors. The common stem "In the next three months do you..." provided a time for the direct respondents to regard their intentions for the short-term future, like "Do you intend to pay attention to the portions sizes during the meals?", i.e. choose small portions of preparations and/or foods, or in case the portions are too big will they share them with someone?

**Situation:** six items examined an individual's mental representation of the food available in their home environment. They assessed the presence of fruit and vegetables, healthy snacks (e.g., muesli bar, dried fruits, yogurts and fruits) and drinks (e.g., water purifier, coconut water and homemade natural fruit juices), such as "At home vegetables are often served at meals". A six-point Likert-type scale again examined the respondents' level of agreement/disagreement with each item.

**Social support:** five items assessed the frequency of social support, i.e. from parents/caregivers and friends for healthy eating, and it was used a five-point Likert-type scale (1 = never to 5 = always). A time referent was provided to encourage consideration of supportive behaviors received during the previous three months. For example: "Do your friends support you to choose healthy foods when you are having meals together e.g., in the mall or at school"; "do your parents/caregivers sometimes prepare a healthy dinner with homemade preparations, such as rice, beans, vegetables, salads and meats in general?"

**Behavioral strategies:** the behavioral strategies scale comprised five items that assessed the frequency (1 = never to 5 = always) at which various healthy eating behavioral strategies

were employed during the previous three months to reinforce its behaviors. Specifically, several methods for enhancing the enjoyment of healthy eating, setting goals for healthy eating, and self-monitoring eating behaviors were explored, such as "Did you find a way to make fruits and vegetables more enjoyable?" (e.g. for fruits, choose seasonable ones that are more sweet and colorful, and for vegetables, try to include them in several preparations like pies and stir and cooked meats).

**Outcome expectations:** a six-point Likert-type scale (1 = totally disagree to 6 = totally agree) assessed the expectations of a five-item belief about physical and cognitive benefits of healthy eating (e.g., healthy eating like do not skip breakfast can help me have a better school performance, i.e. get good grades).

**Outcome expectancies:** a five-item questionnaire corresponding to personal evaluations of the importance of each expectations on the benefit, using a four-point Likert-type scale (1 = not all important to 4 = extremely important), such as "How is it important for you to have a good performance at school, i.e. get good grades?"

### Questionnaire administration

After approval was received from the Ethics Committee of the School of Public Health, University of São Paulo, Brazil, the consent was obtained from the principals of three public elementary and high schools from the city of São Paulo for their school's involvement in the questionnaire administration. Parents and/or caregivers provided the written informed consent to complete the study in the summer of 2013.

### Analysis

Descriptive statistics were obtained for all variables including means (M), standard deviation (SD), and frequencies (f). The proportion of missing data was negligible (0.57%), thus mean substitution was the preferred imputation method employed rather than exclusion methods to manage incomplete data<sup>11</sup>. The SPSS 21.0 and AMOS (16.0) programs were used to conduct all the analyses with a significant 5% level ( $p \leq 0.05$ ).

The confirmatory factor analysis (CFA) was performed to examine model fit for each scale. A non-significant  $\chi^2$  result ( $p \geq 0.05$ ) indicates a good fit of the model being examined. However, a rejection of the hypothesized model can be an indication that the  $\chi^2$  is too sensitive to sample size<sup>15</sup>, resulting in the need for additional model-fit indices to be examined. Thus, the following model-fit indices were assessed from baseline data:  $\chi^2$ , root mean error of approximation (RMSEA), goodness-of-fit (GFI), adjusted goodness-of-fit (AGFI) and comparative fit (CFI)<sup>15</sup>. The RMSEA is usually considered the key index in assessing model fit with scores of 0.08, 0.06 and 0.0 that mean

acceptable, close and exact fits respectively. With regard to GFI, AGF and CFI, scores 0.9, 0.95 or equal to 1 are considered adequate, good and exact-fit of the model respectively<sup>11</sup>.

To conduct the reliability of each scale, a one-way analysis of variance (ANOVA) was performed to determine differences between repeated administrations [Test 2 (T2) – test 1 (T1)]. In order to provide a coefficient of individual repeatability, the 95% limits of agreement were calculated. Scores for the difference between test administrations (T2 – T1) were plotted against the test-retest mean [(T1 + T2)/2] for each individual, after which the range of differences decreased within the mean of the differences  $\pm 1.96$  standard deviations was calculated<sup>16,17</sup>. Bivariate correlations between the test-retest difference and mean were also obtained, confirming if the limits of agreement were consistent with a range of measurements, as indicated by a small and non-significant correlation.

Intraclass correlation coefficients (ICCs) provide a measure of rank order repeatability, and an ICC score higher than 0.75 is considered excellent reliability. Cronbach's alpha coefficient was also calculated for internal consistency of each scale, with values higher than 0.6 being acceptable.

## RESULTS

### Descriptive statistics

The study sample consisted of 173 elementary and high school students ( $M=15.3\pm 1.53$  years old; 56.1% male), most of them were born in the city of São Paulo (83.8%), followed by 9.5% who were born in the countryside of the State of São Paulo and 7.2% from the countryside of Brazilian Northeast (the lowest Develop Human Index worldwide). Regarding their ethnic/racial background, most of them considered themselves as brown (50.3%) and white (31.2%). There were no statistical significances between sexes for test-retest (T1-T2) for any of the scales, as well in separated analyses by sex. Table 1 presents results for scales means and SD.

**Table 1.** Questionnaire means and standard deviation, São Paulo, Brazil, 2013

| Constructs            | Range (Number of items) | T1 baseline     | T2 test-retest  |
|-----------------------|-------------------------|-----------------|-----------------|
|                       |                         | Mean $\pm$ SD   | Mean $\pm$ SD   |
| Self-efficacy         | 1-6 (5)                 | 3.78 $\pm$ 0.84 | 3.7 $\pm$ 0.87  |
| Intensions            | 1-4 (5)                 | 2.67 $\pm$ 0.74 | 3.40 $\pm$ 0.72 |
| Situation             | 1-6 (6)                 | 4.80 $\pm$ 0.77 | 4.55 $\pm$ 0.99 |
| Behavioral strategies | 1-5 (6)                 | 2.98 $\pm$ 0.86 | 2.92 $\pm$ 0.72 |
| Social support        | 1-5 (5)                 | 3.51 $\pm$ 0.70 | 3.40 $\pm$ 0.72 |
| Outcome expectations  | 1-6 (5)                 | 4.96 $\pm$ 0.70 | 4.99 $\pm$ 0.92 |
| Outcome expectancies  | 1-4 (5)                 | 3.38 $\pm$ 0.49 | 3.44 $\pm$ 0.36 |

SD: standard deviation

### Cultural adaption

The cultural adaption, which included all the mentioned steps, suggested changes of some words and adaptations of some expressions to obtain the final version of the Brazilian Social Cognitive Scales related to adolescents' dietary behavior. The modifications done in the questions, according to the experts' opinion, can be seen in Table 2.

After the suggested changes and adaptations, a box with the wording of "what is a portion size regarding fruit and vegetables" was added to the questionnaire for a better comprehension, usefulness and effectiveness of the scale. Furthermore, wordings explaining healthy eating and smart choices were substituted according to Philippi<sup>18</sup>.

The final version in Portuguese was applied for the adolescents and no difficulties were found regarding the comprehension of the scales. No discrepancies were seen regarding the definition and application method of the scales. However, both students and experts reported having a misunderstanding in some Likert scale: strongly disagree, disagree, partially disagree, partially agree, agree and strongly agree — especially because of the subtle differences between disagree/agree and partly disagree/agree. Thus, five of options of answers were suggested and adopted: totally disagree, disagree, I do not disagree nor agree, agree and totally agree — excluding the options partially disagree/agree.

### Confirmatory factor analysis

The results of each original scale provided an adequate to exact fit of the hypothesized model. Situations, behavioral strategies, social support and outcome expectancies provided good to exact fit of model, followed by self-efficacy and outcome expectations that had an adequate to good fit of model. Only the variable intentions demonstrated a weak to adequate fit of model (0.79 to 0.93), as seen in Table 3.

### Reliability analysis

The final reliability results are presented in Table 3. Bland-Altman's analyses revealed excellent narrow agreement of limits for intentions and situations and favorable to week for the other scales. No significant bivariate correlations between test-retest difference and mean indicate that the limits of agreement were consistent through out the range of measures for all the scales. ICC scores for all the scales indicated adequate to excellent rank order repeatability ranging from 0.65 (outcome expectancies) to 0.93 (intentions). Similarly, the internal consistency reliability of all measures were adequate; Cronbach's alpha values ranged from 0.66 (outcome expectancies) to 0.94 (intentions).

**Table 2.** Modifications performed in the Portuguese version of the Social Cognitive Scale of adolescent dietary behaviors according to the experts' suggestions, São Paulo, Brazil, 2013

| Constructs            | Original Scale   | Portuguese Scale  | Justification  | % Experts |
|-----------------------|--|---|--|-----------|
| Self-efficacy         | 1. "(...) "lite milk rather than "full cream" milk"<br>3. "(...) eat 3 servings of fruit each day"<br>5. "I find it easy to have healthy portion sizes during the meals (...)" | 1. "(...) cooked, baked and grilled preparations"<br>3. "(...) eat 5 servings of fruit each day"<br>5. "I find it easy to pay attention on the portions sizes during the meals"   | 1. Brazilian guidelines for healthy eating do not recommend low fat milk for children and adolescents.<br>3. The Brazilian Food Pyramid for adolescents recommends 5 servings/day of fruits and 4 for vegetables.<br>5. The literal translation did not seem appropriate.  | 25        |
| Intentions            | 1. "(...) 3 servings of fruits each day?"<br>5. "(...) eat healthier portion sizes during the meals (e.g., not eating until you feel full)"                                    | 1. "(...) 5 servings of fruits each day?"<br>5. "(...) pay attention on the portions sizes during the meals (e.g., choose small portions of foods/preparations, or in case portions are big share with someone"   | 1. The Brazilian food pyramid recommendation.<br>5. Easy comprehension for low-income Brazilian adolescents followed by an example.  | 80        |
| Social support        | 3. "(...) parents prepared a healthy home-cooked dinner for you?"  | 3. "(...) (e.g., rice, beans, stir/cooked vegetables, salads (lettuce/leaves and tomato) and meat"  | 3. Easy comprehension of what is a healthy dinner regarding the Brazilian habits.  | 80        |
| Behavioral strategies | 1. "(...) lite milk reduced fat yogurt"<br>2. "(...) choose water or diet drinks (...) soft drink"<br>3. "(...) felt full?"<br>6. "(...) FV more enjoyable?"                   | 1. "(...) cooked, baked and grilled preparations"<br>2. "(...) choose water, coconut water or natural juices without added sugar rather than artificial juices (e.g., powder juices or carton juices"<br>3. "(...) felt satisfied?"<br>6. "(...) (e.g., for fruits: choose seasonable, colorful and more sweet fruits as well as fruit added in yogurts and jellies; for vegetables: included in preparations such as pie, stir and cooked meats and omelets" | 1. Brazilian guidelines for healthy eating do not recommend low fat milk for children and adolescents.<br>2. Even diet soft drink has no calories, it is an industrial drink and Brazilian guidelines for healthy eating do not recommend it.<br>3. Semantics and contexts linguistics.<br>6. Easy comprehension according to the Brazilian reality.                                 | 90        |
| Situation             | 2. "(...) E.g., cold water in the fridge, sugar free drinks, reduced fat milk"<br>3. "(...) Including fresh, canned or dried fruits"   | 2. "At home there are drinks such as water, coconut water, and homemade natural juices"<br>3. "At home fresh fruits are often available at meals"<br>5 and 6. "At meals fruits and vegetables are often served at home"   | 2. The expression sugar-free drinks can involve drinks with artificial sweeteners and artificial sweeteners are not recommended for adolescents according to the national guidelines.<br>3. Canned fruits in Brazil are starting to be introduced at the supermarkets but they are still very expensive<br>5 and 6. Two questions were included to confirm if FV is served at meals. | 80        |
| Outcome expectations  | 4. "(...) (e.g., not skipping meals) (...) my concentration at school"<br>5. "(...) me feel more energetic (...)"  | 4. "(...) (e.g., not skipping breakfast) can help me have a better school performance, for example, have good grades"<br>5. "(...) feel less tired during the day"  | 4. Skipping breakfast is very common among the adolescents rather than others meals. Concentration was replaced for performance due to linguistics reasons.<br>5. More energetic was substituted to less tired due to linguistics reasons.   | 90        |
| Outcome expectancies  | 4. "(...) improving your concentration at school"<br>5. "(...) feeling more energetic to you?"   | 4. "(...) can help me have a better school performance, for example, have good grades"<br>5. "(...) feel less tired during the day"   | 4. Skipping breakfast is very common among the adolescents rather than others meals. Concentration was replaced for performance due to linguistics reasons.<br>5. More energetic was substituted to less tired due to linguistics reasons.   | 80        |

FV: fruits and vegetables.

**Table 3.** Reliability results, model fit indices, and factor loadings, São Paulo, Brazil, 2013

|                       | Reliability Results |            |                  |                | Validity results |       |      |      |      |                 |
|-----------------------|---------------------|------------|------------------|----------------|------------------|-------|------|------|------|-----------------|
|                       | R                   | 95% LOM    | ICC (95%CI)      | Cronbach alpha | $\chi^2$ (p)     | RMSEA | CFI  | GFI  | AGFI | Factor loadings |
| Self-efficacy         | 0.47                | 0.53–3.67  | 0.77 (0.51–0.91) | 0.77           | 13.58 (0.01)     | 0.10  | 0.92 | 0.97 | 0.91 | 0.04–0.71       |
| Intentions            | -0.02               | 0.77–3.01  | 0.93 (0.87–0.97) | 0.94           | 38.75 (0.00)     | 0.19  | 0.89 | 0.93 | 0.79 | 0.72–0.89       |
| Situation             | -0.02               | -1.46–4.70 | 0.91 (0.83–0.96) | 0.92           | 10.26 (0.17)     | 0.05  | 0.99 | 0.98 | 0.94 | 0.57–0.77       |
| Behavioral strategies | 0.37                | -0.17–3.49 | 0.73 (0.49–0.89) | 0.74           | 13.92 (0.18)     | 0.04  | 0.99 | 0.97 | 0.95 | 0.62–0.85       |
| Social support        | 0.35                | -0.18–3.49 | 0.80 (0.61–0.92) | 0.81           | 4.39 (0.22)      | 0.05  | 0.99 | 0.99 | 0.95 | 0.33–0.92       |
| Outcome expectations  | 0.46                | -0.02–5.00 | 0.85 (0.72–0.94) | 0.86           | 16.79 (0.01)     | 0.10  | 0.95 | 0.97 | 0.91 | 0.45–0.87       |
| Outcome expectancies  | -0.03               | -0.02–3.45 | 0.65 (0.32–0.85) | 0.66           | 1.65 (0.44)      | 0.00  | 1.00 | 0.99 | 0.97 | 0.27–1.58       |

R means bivariate correlations between the difference (T2-T1) and the mean [(T1+T2)]/2; 95% limits of agreement calculated as the range of differences falling within the mean of the difference  $\pm$  1.96 SDs; ICC: intraclass correlation;  $\chi^2$ : chi-square; p: probability; RMSEA: root mean square error of approximation; GFI: goodness of fit index; AGFI: adjusted goodness of fit index; CFI: comparative fit index.

## DISCUSSION

The purpose of this study was to culturally adapt and assess the reliability and factorial validity of the main social cognitive aspects of adolescents' dietary behaviors. Few studies have assessed the validity of theoretical approach, such as SCT, and dietary behavior change in youth<sup>1</sup>. Most of the recently studies in Brazilian adolescents are cross-sectional and use dietary recalls or food frequency questionnaires as main variables to assess dietary intake, which is a more quantitative approach<sup>19-22</sup>.

The food choice process seemed to include social cognitive aspects, in which conflicting values for food choices were integrated and brought into alignment with the desired consequences. Hence, educators and practitioners should recognize the dilemmas adolescents face when making food choices and help them develop strategies for balancing less healthful with more healthful food items<sup>23</sup>, through their own ability for making healthy food choices, proximal goals, food environment, social support, behavioral strategies, beliefs and personal values of healthy eating<sup>1,4</sup>.

Therefore, the adolescents' dietary behaviors should be assessed by quality measures with good-strong psychometrics properties for identifying hypothesized mechanisms of their behavior change<sup>1,11</sup>. The Brazilian social cognitive measures related to adolescents' dietary behavior showed adequate internal consistency and acceptable-to-strong reproducibility from the Australian version. Item 1 on the self-efficacy scale, which assesses difficulties in choosing low-fat foods, did not seem informative in this scale, because it did not load properly. Item 1 on the social support scale, which evaluated friends/peers encouragement of healthy eating, did not load adequately in the whole scale, so for better results social support scale was divided into family support and friends/peer support.

Furthermore, intentions, behavioral strategies and outcome expectations and expectancies loaded more strongly

than they had in the Australian version, as well as this loading seemed informative. These findings may be explained by the differences in cultural backgrounds. Although both studies were conducted with adolescents from low-income communities, the facilities and barriers to acquire healthy behaviors are different, for example, the price, availability of food items at home, school environment and transportation and store accessibility of shopping frequency<sup>24,25</sup>.

In the development and validation study of the Australian version, the instrument showed good internal consistency<sup>11</sup>. Similar to our analysis, the self-efficacy scale presented better psychometric adequacy with the removal of items. In the Brazilian version, due to the Brazilian Food Pyramid guideline and smart choices concept<sup>18</sup>, some adjustments were made in three items regarding the number of FV portions sizes. Also, the examples of low-/non-fat milk for smart choices was adapted for children and adolescents, that is, choose stir, baked or cooked preparations instead of fried preparations; and healthy low-fat snacks such as baked pastries ("cheese bread" and "potato bread" instead of fried pastries — "fried chicken/meat/cheese pastry") or whole wheat sandwiches with white cheese and turkey breast, cheese spread and/or marmalade.

In contrast to our analysis in the social cognitive scale, the friends/peer was along with parents support, but Dewar et al.<sup>26</sup> in another scale development of social cognitive measures related to physical activity separated both items, just like the Brazilian version of dietary behaviors. One reason that suggests splitting social support in two scales is: friends and parents support can be explained by differences on level of encouragement, i.e. family plays a positive role on their kids eating behaviors<sup>2,27,28</sup>. Utter et al.<sup>28</sup> found that frequently family meals were associated with greater consumption of fruit and vegetable ( $p < 0.001$ ), and breakfast ( $p < 0.001$ ). Adolescents who frequently shared family meals were also more likely to report that what they ate in the past week was healthier than adolescents who did not ( $p < 0.001$ ).

Thus, family meals may provide an important opportunity for young people to consume healthy food.

Similar to the Brazilian version, the intentions measure did not require further refinement, demonstrating good model-fit. However, on the other hand, the Australian version of the behavioral strategies showed acceptable fit indices and removed one-factor structure to provide a good-to-exact fit of the model. These findings may be explained by the cultural adaption of the questionnaire before testing in an adolescent sample, i.e., changing expressions and wordings according to the Brazilian reality of the food guidelines and the adequacy of the language for low-income adolescents providing examples and short definitions of the concepts. Examples and short definitions of concepts were also performed in a study with a diverse sample of adolescent from different ethnic and socioeconomic backgrounds from Boston, New England, United States of America, and indicated that the wording of this question was well-understood by adolescents<sup>29</sup>.

The environment scale showed a strong internal consistency and an adequate factor loading. Differently from the Australian, in the Portuguese language version, two more questions regarding the accessibility of FV at home meals were added. As part of a longitudinal study conducted with adolescents from public schools of Minnesota, MN, United States, it was also assessed both the accessibility and availability of FV at the home environment. Results showed that home FV availability, home FV accessibility, parental encouragement to eat FV, and family meal frequency explained 26.7% of the variance to eat FV. Therefore, it is important to understand those factors related to home food environment when developing interventions aimed at enhancing, as well as, motivating children to a healthy eating<sup>30</sup>.

Regarding the outcome expectations and expectancies scales, higher internal consistency and factor loadings were found in the Brazilian compared to the Australian scale. Some adjustments were made in two items for better comprehension of the Brazilian adolescents. The wordings "improve my concentration at school" and "more energetic" were changed to "have a good performance at school, for example having good grades" and "let me be less tired", respectively. The academic performance of children affects their future educational attainment and health, and it has therefore emerged as a public health concern. Academic performance could be associated with higher education, and as a consequence with higher socioeconomic status, affecting the health by influencing work and economic condition, lifestyle factors like nutrition and physical activity, and social psychological factors. Several factors affect academic performance including eating behaviors<sup>31</sup>. Therefore,

due to the Brazilian rates of uncompleted elementary, secondary and high schools be high, the changing of the wording followed by an example can be an encouragement for keeping on the studies.

The study had both strengths and limitations. The strengths are that we got a diverse sample of adolescents from different areas of the city (North to South areas) as well as different born locations (Japan) to countryside of the Northwest). However, the sample number was too small to conduct meaningful sub-group analyses for gender.

The tests of validity used in the current study were not extensive. Future researchers are encouraged to test concurrent and convergent validity of these scales by comparing them with the Brazilian and Australian versions, as well as others similarities validated of social cognitive measures related to dietary behaviors. A suggestion is to test each scale against the percentage of energy intake from the food groups of dietary guidelines of each country. For example, in Brazil it should have the use of the Food Guide Pyramid as well as the concept of smart choices, that is choose foods with low amounts of fat, sugar and salt and higher intake of fiber, whole grains and fruit and vegetables<sup>18</sup>.

Finally, it is recommended that further analysis about the psychometric properties be done with other Brazilian populations, including children and adults. Nonetheless, it is believed that "Social cognitive scales for adolescent dietary behavior" could be useful in the study of adolescent dietary behaviors and is potentially able to highlight differences in the social cognitive aspects. Studies with clinical populations could use this tool to focus on the association with food and "Social Cognitive scales" would be also helpful for researchers interested in studying those aspects and the differences between self-efficacy, intentions, social support, strategies, situations (environment), and outcome expectations and expectancies and relation with food among adolescents. The validity of the Brazilian version of "Social Cognitive scales for adolescents related to dietary behavior" showed that it could be used among Brazilian adolescents. Future research should focus on further validating the tool in more diverse cultures and populations.

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