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Brazilian Cooking Skills Questionnaire Evaluation on the Using/Cooking and Consumption of Fruits and Vegetables

INTRODUCTION

Cooking skills have been widely debated in the academic literature, with the main focus on the relationship between cooking attitudes and skills to healthy eating habits [1-5]. The studies that aimed to show this relationship are not homogeneous and there is still a lack of consensus in the literature to evidence it. Even that, most of them has showed people who has more confidence to cook, shows better diet's quality than ones who do not.

Studies show that the use of cooking skills have been in decline among young adults, especially among those entering college level education [3,6,7]. Whether this is due to lack of basic skills or issues such as time and convenience of processed foods and take-away is not clear. Students face barriers to preparing their own meals, ranging from a low confidence in choosing and preparing foods, limited knowledge of cooking [7,8], easy availability and accessibility to convenience food [3,6,7], high frequency of eating away from home [3,7,9,10], time pressures and a shortage of money [3,7,11]. So, the general decrease in cooking practices may lead these individuals to unhealthy eating habits and an over-reliance on processed and ultra-processed foods, decreasing the consumption of fruits and vegetables, mainly [3,6,7,9,10]. Once you leave food preparation to others then you are less likely to be in control of your food intake.

Cooking skills can be defined as individual's attitudes, knowledge and confidence with respect to the purchasing, planning and preparing of food from scratch (fresh or raw or unprocessed), as well as the use of processed and ultra-processed foods either on their own or as components of a meal. Using the first category of foods requires pre-preparation culinary

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techniques (such as washing, peeling, cutting) and it is healthier than the using of processed and ultra-processed foods [1,12,13], as well as than eating away from home, because this practice is related to low cooking skills and poor diets [3,7,9,10].

There is a lack of consensus on how to best evaluate cooking skills and healthy eating outcomes in young adults and whether to attribute limited cooking to a lack of skills or to other social factors [4,514,15]. Validated questionnaires that measure the use of cooking skills were identified [2,15-24]. Factor analysis of cooking skills questionnaires was applied to explore the constructs or emerging hypothesis that underpin the construct to be measured or reduce the number of items [16,18-22,25]. This analysis is an interdependent technique that define the fundamental structure among a set of variables [26]. Two of these questionnaires used exclusively the exploratory factor analysis [16, 25] and three used the confirmatory factor analysis to test how well the questionnaire items represented the theoretical constructs of the current study [19,20,22]. Some of these cooking skills questionnaires contain references to the underpinning theory which the traits, such as attitutes and behaviours are built on. The theoretical basis of many of theses measurements were grounded in the concept of 'Food Agency' [20] or Self-Determination Theory [19,22] or Social Cognitive Theory [16,25]. It is noteworthy, however that cooking from scratch was a key variable identified as common in some articles [16, 20-22, 25].

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Bailey et al. [22] developed a cooking skills evaluation questionnaire based on self-determination theory and identified some health-related attitudes and motivations, but did not identify what health measures or indicators for evaluating cooking skills could be used, such as, the use of vegetables in recipes and meal planning. The cooking and food skills measurement developed by Lavelle et al. [21] did not include a measure of healthy outcomes thus they had to apply another complementary questionnaire to assess diet quality.

50   Among these cooking skills questionnaires, one was judged to be more appropriate for

51   use with diverse adult populations in evaluating cooking skills related to healthy eating

52   [15,16,25]. This questionnaire was originally developed to evaluate the cooking intervention

53   program 'Cooking with a Chef' (CWC) designed by researchers from Clemson University in

54   South Carolina, United States of America. The CWC questionnaire was based on Social

55   Cognitive Theory and emphasizes increasing knowledge, positive attitude, and self-efficacy

56   related to cooking and healthful eating. The healthy eating aspects of this questionnaire is

57   related to the availability, accessibility, frequency, attitude and confidence to use and eat fruits

58   and vegetables [16,25]. This questionnaire was cross-adapted [27] and validated for use in

59   Brazil by the known-groups method. This method used a test that employed detecting the

60   differences in cooking skills between men and women as well as between high and low levels

61   of cooking knowledge of university students. This validation process clarified measures for

62   these different groups regarding attitude, confidence and behavior for cooking in a healthier

63   way. The instrument has adopted and subsequently renamed the Brazilian Cooking Skills and

64   Healthy Eating Questionnaire - BCSQ [15].

65   The BCSQ is based on the theoretical framework from CWC questionnaire related to an

66   individual's self-efficacy, behaviors and attitudes toward cooking as well as employing

67   measures of diet quality. Examples of items from these measures include self-efficacy in using

68   fruits and vegetables to cook and eat, cooking from scratch, and frequency in using fewer

69   healthy convenience food items and leftovers, and the availability and accessibility of fruits and

70   vegetables ready to use and eat at home [10,15,16,25,28,29]. However, the definition of

71   cooking skills seems to appear unresolved in the literature regading which attitutes and

72   behaviours are considered and if it involves only the confidence of cooking from scratch,

73   excluding the use of convenience foods or leftovers, for example [5,7,13]. This fact justifies the

74 diverse and big number of items belonging to the available questionnaires on the literature

75 [16,18-22,25].

76 Constructs usually emerge from theories or observations, which may further define

77 psychological attributes and can be culturally specific [30]. The constructs that compose the

78 cooking skills concept are the abilities related to food (use of unprocessed and

79 processed/ultraprocessed foos) and to the individual (cooking atittute, behavior, self-efficacy

80 and knowledge) [13, 15, 25, 27-29]. Cooking attitute is relate to how interested the person is to

81 cook or prepare his/her meal (e.g: I like to try new recipes; I think cooking is tiring; etc).

82 Cooking behavior is the frequency of people in preparing their meals or cooking (e.g. using

83 fresh ingredients to cook once a week). Self-efficacy in cooking is related to the confidence to

84 plan and prepare meals or perform some culinary techniques (e.g. confident in boiling, or

85 cooking with fresh ingredients). Cooking knowledge is about food, nutrition, hygiene,

86 perceptual and conceptual abilities (e.g. predict the final result of a recipe, combine ingredients,

87 etc) [13, 25, 27-29]. Thus, some current literature denotes that cofirmatory factor analysis tests

88 the extent to which a theoretical pattern of prespecified constructs represents the actual data

89 [26]. This analysis is able to refine an instrument such as the BCSQ to the lowest number of

90 items (questions) that can explaim the constructs identified in the research questionnaire for

91 cooking attitude, behavior and self-efficacy, noted as a critical gap.

92 Until now, factor analysis has not been carried out on the BCSQ and it is supported by

93 the theoretical framework identified by this healthy eating construct [15]. The fact that there is

94 no commonly agreed measure for evaluating cooking skills and healthy eating as a construct,

95 makes such an evaluation of the BCSQ with the factor analysis opportune. The study explored

96 the factor structure of the Brazilian Cooking Skills and Healthy Eating questionnaire (BCSQ)

97 to identify the barriers to cook, use and consumption of fruits and vegetables by young adults.

98

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METHODS

Measures

The questionnaire was originally developed and validated in by Michaud [16] and Condrasky *et al*. [25] at Clemson University to evaluated the Cooking with a Chef (CWC) intervention program in South Carolina, U.S. The CWC questionnaire consisted of six scales, one knowledge evaluation section, and a short index, with a total of 64 items. The online format of the questionnaire was tested with university students [10,29,31], in written form with parents, child's caregivers [16,25,32], and cooks [28]. The CWC questionnaire presented predictive and construct validity and demonstrated correlations among the scales and between people with low and high cooking knowledge levels [16]. All the scales showed high correlations, test-retest levels, internal consistency as well as factor loadings, except for the Cooking Behavior measure [16,25].

This questionnaire was cross-adapted to Brazil, maintaining all original scales and items with some ammendments and being renamed as Brazilian Cooking Skills and Healthy Eating Questionnaire – BCSQ [27]**.** The BCSQ's items are distributed across 8 measures [15], incorporating all items and structure from U.S. version, as seen in **Chart 1** and in **Table 1**.

The Availability and Accessibility of Fruits and Vegetables (AAFV) index measured the availability of fruits and vegetable over the past week. The Cooking Attitude (CA) measured how respondents felt about cooking. The Cooking Behavior (CB) measured the frequency of common cooking activities based on the Food and Cooking Skills Questionnaire. Four self-efficacy scales (Produce Consumption Self-Efficacy - SEPC, Cooking SelfEfficacy - SEC, Using Basic Cooking Techniques - SETC, Self-Efficacy for Using Fruits, Vegetables, and Seasonings - SEFVS) were developed to evaluate cooking and nutrition related selfefficacy. They measured the degree of confidence in meeting the government's three recommendations

for the consumption of fruits and vegetables (SEPC), performing 6 basic cooking activities (SEC), 12 specific cooking techniques (SECT), and using fruits and vegetables when cooking. The last measure evaluated the level of cooking knowledge by the Knowledge of Cooking Terms and Techniques (CTT) [15,25,27-29] (**supplementary data; Chart 1; Table 1**).

The BSCQ was then validated by the known-groups method, which showed differences in cooking skills between men and women as well as between high and low levels of cooking knowledge of university students. Cooking Attitude (CA) and Behaviour (CB) scales showed low internal consistency and Self-Efficacy in Using Basic Cooking Techniques (SECT) was not able to detect differences between man and woman. This validation process clarified measures for these different groups regarding attitude, confidence and behavior for cooking in a healthier way. [15]. The BCSQ was applied in a randomized controlled intervention designed to Brazilian university students with a six-month follow-up study. The BCSQ was self-administered on-line by intervention and control group before, imediately after and six months after intervention was delivered. This evaluation showed changes in the intervention group before, after and six months after intervention as well as between intervention and control groups, except for answers from Cooking Behaviour scale [31].

The higher the value of the measures, the higher the cooking skills practiced/used.

Participants

A baseline was developed from a larger study (4,112 freshmen) with university students from the Federal University of Sana Catarina - UFSC, Brazil, in 2015 (n=767) [15]. A sample size (power calculation) was calculated for the validation process, based on ten people responding to each item (10:1) in the questionnaire [26], considering the sample size effect, representativeness, and losses, the final sample size was 730 participants [15].

148   The inclusion criteria were students (16 years or over) enrolled in undergraduate

149   programs at UFSC, as freshmen in 2015. Those enrolled in postgraduate or online

150   undergraduate courses were excluded [15].

151

152   **Procedures**

153   Students were invited to participate through e-mail and leaflets distributed throughout

154   campus. The questionnaire was available on the university's website during the period of the

155   online survey (August to December 2015). Leaflets were distributed in the classrooms and in

156   queues in the university cafeteria (dining hall), which contained a quick response code

157   (*QRcode*) for participants to easily access the online questionnaire on their smartphones, if they

158   chose to do so. Participants accessed the online questionnaire until the established sample size

159   was achieved. Sociodemographic data related to age, gender, ethnicity, income classification,

160   if they had children, self-reported cooking knowledge, living arrangements, and lunch or dinner

161   location were also collected to characterize the population of the study [15].

162   The UFSC Ethics Committee approved the study and informed consent was obtained

163   from all participants.

164

165   **Data analysis**

166   Mean and standard deviations for sociodemographic data and for each item of scales

167   were calculated. The 48 items (items 9 to 56 from Cooking Attitude - CA, Cooking Behavior

168   - CB, Self-Efficacy in Cooking – SEPC, Self-Efficacy in Cooking - SEC, Self-Efficacy in Using

169   Cooking Techniques - SECT, and Self-Efficacy in Using Fruits, Vegetables and Seazonings -

170   SEFVS scales) were submitted to factor analysis to determine the factor structure of BCSQ

171   [15]. Dichotomous (AAFV) and multiple-choice (CTT) measures were not based on a five-

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172 point Likert scales as the other ones, so that they were not submitted to factor analysis, as

173 recommended by Streiner, Norman and Cairney [30].

174 Corrected item-total correlations for each item were calculated and values greater than

175 0.3 were accepted. The internal consistency reliability for each scale was examined using

176 Cronbach's coefficients, where alpha greater than 0.7 was considered acceptable [26].

177

178 ***Exploratory Factor Analysis***

179 The Exploratory Factor Analysis (EFA) was run using the extraction method of

180 Principal Axis Factoring (PAF) onto data from the BCSQ's validation [15]. These data points

181 were submitted to oblique (promax) rotation [30,33]. *Eigenvalues* >1.0 and scree plot were used

182 to identify the number of dimensions to retain. The Kaiser-Mwyer-Olkin (KMO) test was

183 conducted, adopting >0.7 value. The Barllet's esfericity was also tested. Factor loading ≥ 0.3

184 was considered acceptable, by observing pattern matrix, and more than three items per factor.

185 Communalities of >0.3 was considered acceptable [26]. Analysis was run with the Statistical

186 Package for the Social Sciences SPSS® version 18.0 [34].

187 Items with low factor loadings, cross-loadings, low communalities, and higher alpha

188 coefficients if they were excluded. Factors with less than three items were reviewed, rearranged,

189 or excluded [26].

190

191 ***Confirmatory factor analysis***

192 The Confirmatory Factor Analysis (CFA) was run to examine the factorial structure of

193 the model. Since this is the first empirical evaluation for the Brazilian questionnaire, the

194 research team opted to set loadings above 0.50 as acceptable in accordance with the literature

195 [35]. Items with high covariance among measure errors (r>0.7) were excluded. The final model

196 was tested through the most recommended for fit indices in the literature. These fit indices

197   include: Chi-square (X^2), Degrees of freedom (DF), Chi square ratio (X^2/df), Turcker Lewis

198   Index (TLI), Normed Fit Index (NFI), Root Mean Square Error of Approximation (RMSEA),

199   Comparative Fit Index (CFI), Standardized Root Mean Square (SRMS), Goodness of Fit Index

200   (GFI), and Expected Cross-validation Index (ECVI) [36]. CFA was estimated using the

201   "lavaan" package [37], available as a package in the R statistical language [38].

202

203   *Convergent Validity, Discriminant Validity, and Internal Consistency*

204   Convergent validity assessed the correlation concept of two measures. To do so, we

205   used the Average Variance Extracted (AVE) to analyse the convergent validity, with a cut of

206   point of 0.5. On the other hand, discriminant validity is the extent to which a construct is truly

207   distinct from other constructs. Discriminant validity was assessed by comparing the AVE with

208   the average shared squared variance (ASV) and maximum shared variance (MSV), considered

209   adequate if AVE>ASV and AVE>MSV. Composite reliability was also calculated using

210   reliability measures derived from the CFA, with values greater than 0.7 considered satisfactory

211   [26].

212

213   *Multilevel linear regression*

214   Multilevel linear regression models were used to analyse variations on the BCSQ

215   dimension among the university students' sample when grouped by gender (female and male),

216   living arrangements (alone, with parents, with partner, with colleagues and alone), knowing

217   how to cook (yes and no), place of main meal (home and outside home) and time to cook at

218   home (< 1 hours, 1 hours to 3 hours and ≥ 3 hours). Multilevel analysis provides a more robust,

219   trustable, and flexible alternative by considering the hierarchy structure of the data as well as

220   the available information between-groups. This analysis estimates the participants' scores based

221   on the information derived from the individual and groups characteristics [39]. Thus, varying-

222   intercepts models [40] were employed allowing the intercept to vary between participants

223   responses (Level 1) nested by groups (Level 2; gender, living arrangements, knowing how to

224   cook, location of main meal and the time spent in cooking at home), which provide a more

225   precise estimate. Estimates were derived using Maximum Likelihood with the "lme4" package

226   [40], in the R statistical language [38].

227

228

229   **RESULTS**

230

231   **Sample characteristics**

232   Based on the 850 students who responded to the online Brazilian cooking skills and

233   healthy eating questionnaire (BCSQ), 767 were eligible for the present study, and their

234   sociodemographic characteristics can be found in **Table 2**.

235

236   **Exploratory Factor Analysis (EFA)**

237   The EFA indicated the sample size (KMO=0.922) was adequate and significant

238   sphericity (Bartlett's test <0.000). A total of eleven factors (11) explained 60,39% of the

239   variance. Four items were excluded because they showed low factor loadings (items 10, 44, 45,

240   47), another four with low communalities (items 14, 19, 26, 39), and two because they were

241   alone in an only factor (items 25 and 26) (**Chart 1; Table 3**). Thus, EFA was run again without

242   these items. This second test suggested eight factors, however items with low factor loadings

243   (item 23), low communality (item 21), or loading onto a different factor from its original one

244   (item 34), were excluded (**Chart 1; Table 3**). Thus, a seven-factor solution was decided on.

245   Low internal consistency was found for one factor with three important items (items 16,

246   17, and 24) (**Chart 1; Table 3**). These items evaluate the frequency of cooking from scratch

247 as well as cooking with convenience food. The authors decided to retain this factor and to run

248 a new factor analysis. The resulting scree plot (**Figure 1**) with *eigenvalues* (>1.0) suggested 6

249 factors to retain, with a total of 30 items (**Table 3**).

250 Six extracted factors explained 59,62% of the variance, showing good sample size

251 (KMO=0.903) and indicating significant sphericity (Bartlett's test <0.000) and commonalities

252 ranging from 0.30 to 0.082 (0.56±0.37DP). Item 49 showed low factor loadings (<0.3) and was

253 excluded (**Chart 1; Table 3**).

254 A total of 18 items were excluded. Most of the items behaved like the original

255 questionnaire, with the exception of items belonging to the CB, SECT and SEFVS scales. Items

256 on specific cooking techniques – item 36 (sef-efficacy in using boiling water to cook) and item

257 37 (self-efficacy in simmering) - that originally belonged to the factor from the SECT scale

258 (**Chart 1**), loaded onto factor 1, which is related to self-efficacy of cooking (**Table 3**). Item 48

259 (self-efficacy of using vegetables to cook), which originally belonged to factor 2 (SEFVS - self-

260 efficacy of using fruits, vegetables and seasonings) (**Chart 1**), loaded onto factor 3 (SEPC -

261 produce consumption self-efficacy) (**Table 3**). Items 16 (frequency of cooking from scratch),

262 and 50 (self-efficacy in using fruits to cook) (**Chart 1**) were cross-loaded onto different factors,

263 such as factor 1 (SEC scale) and factor 6 (CB2 scale), and factor 2 (SEFVS scale) and factor 3

264 (SEPC scale), respectively (**Table 3**). However, the researchers decided to keep these items as

265 per the original version of BCSQ. All the factors showed good internal consistency, except

266 factor 6 with items 16, 17, and 24 (α=0.616) (**Table 3**).

267

268 **Confirmatory factor analysis**

269 The 6-factor structure with 29 items (M1) was tested, resulting from the EFA. Several

270 weaknesses were identified in M1 as noted in **Table 4**. Item 17 was then excluded due to low

271 factorial value (<0.3) (**Table 3**) and modification of the indexes suggested covariance between

measure error items. Since the covariances between the errors were high (r>0.8), a decision to exclude items 16, 37 and 56 was made (**Table 3; Table 4**). Additionally, item CB24 was grouped within the factor "CB2", in which it was originally grouped (Jomori et al., 2017), and factor "CB" was eliminated. In testing a new model (M2), we found a better fit, but not satisfactory. M2 also presented items with high covariance (r>0.7) between the errors (24 and 55 items) Thus, both items were excluded from M2 and a new model was tested without these items (M3). An increase of model's fit was found, but it is not still well adequate to indicate high covariances (r>0.7) between errors (**Table 4**). In order to have a best model fit, items 13, 52 and 54 (**Chart 1**) were exclude due to high covariances between errors (**Table 4**). M4 was tested and presented as well fitted and adequate with 20 items and 5 factors (Table 3).

Five-factor structure with 20 items in the Model 4 (M4: 5-factors) seemed to hold the best solution for BCSQ. In this model, Cronbach-α showed adequate for all scales (CA = 0.74; CB = 0.76; SEPC = 0.81; SEC = 0.84; SEFVS = 0.76). **Figure 2** shows the model and covariances and factor loadings values.

Some items showed high-standardized residuals correlations (**Table 5**). However, this did not disturb the final model as proved by adequate fit indexes (Table 4).

These results make sense when the content of items was verified, for example, the item related to the frequency of using leftovers from a home-prepared meal to make a new dish (22) showed high standardized residual correlation with items related to not liking to cook because it takes too much time (9), liking to try a new recipe (12) and with self-efficacy in "preparing meals with what you have at home" (32). In addition, the item "I like to try new recipes" (12) was also highly correlated to the item about the self-efficacy in following a written recipe (31) (**Chart 1; Table 5**).

Commented [MMJ8]: Answer 6

The final BCSQ is showed in the suplemmentary data (**supplementary material**).

Convergent Validity, Discriminant Validity, and Internal Consistency

298   CB and SECP presented evidence of convergent validity (>0.5) and CA, SEC and

299   SEFVS did not (**Table 6**). These two last factors presented an AVE remarkably close to the cut-

300   off point. We found evidence of convergent validity comparing AVE to ASV (AVE>ASV) in

301   all factors, but when comparing AVE to MSV, factors SEC and SEFVS did not presented

302   evidence of convergent validity. Lastly, all factors presented evidence of composite reliability

303   (CR>0.7).

304

305   **Multilevel linear regression**

306   From **Table 7**, a series of multilevel linear regression modelling showed the estimates

307   of BCSQ in relation to gender, living arrangements, know how to cook, place of main meal and

308   time to cook at home.

309   The most important differences noted within cooking behaviors were between females

310   and males; people who lived with parents and those who lived alone; as well as between those

311   who eat their main meal at home compared to those that ate away from home. Self-efficacy in

312   cooking had less influence among those who lived with parents compared to those who lived

313   alone, with partner and/or with children, and with roommates. When comparing students that

314   reported knowing how to cook to those who reported that they do not know how to cook, those

315   who know how to cook showed the highest means for cooking attitude (4.05; IC 3.90- 4.19),

316   self-efficacy in cooking (4.17; IC 3.96-4.38), and using fruits and vegetable to cook (3.74; IC

317   3.50- 3.97). Students who reported knowing how to cook also showed higher mean scores for

318   self-efficacy in fruits and vegetables consumption, but not higher than with the scales

319   mentioned earlier (3.22; IC 3.04-3.41). It seems that time to prepare food at home and eating

320   outside of the home did not influence cooking skill dimensions.

321

322

DISCUSSION

The analytical framework was important to help sustain the structure of the Brazilian Cooking Skills Questionnaire - BCSQ, thus making it shorter, easier to administer and complete. It also showed adequate psychometric proprieties. Based on the validity of the BCSQ, factor analysis suggested a five-factor structure. The number of extracted factors by EFA was explained with consideration to the theoretical constructs adopted by this research reasons rather than the explained total variance, as discussed way forward [26].

Some aspects were highlighted related to the factor on cooking behaviours (CB), also seen by Jomori et al. [15]. It is important to note that most of the items related to the original CB scale have not yet been fully validated [15,16,25]. In the CWC version of the questionnaire, only three of these items (behaviors of cooking from basic ingredients, using convenience foods, and reheating or using leftovers in another meal) were deemed suitable for analysis. Two of them (cooking from basic ingredients and reheating/ or using leftovers in another meal) demonstrated adequate factor loadings (0.30 and 0.38). The item regarding the use of convenience food resulted in a low factor loading (0.23). At the time of the original pilot work, it was noted that the internal consistency of this measure was low (α=0.29) [16].

In the present study, factor 6 with items related to the frequency of cooking from basic ingredients - one about the use of convenience foods, and one regarding the use of convenience combined with basic foods - showed satisfactory factor loadings (Table 3) but low internal consistency (α=0.616). Jomori et al. [15] has previously discussed this, pointing out the low internal consistency found in their study regarding the cooking behavior scale of the BCSQ. It was noted this was probably due to the low correlation among the items of this construct, showing the divergent concepts. It can be explained, on one-hand, by the presence of items that were related to the frequency of cooking from scratch but on-the-other-hand, items that were

348   focused on the use of leftovers, and eating away from home in the BCSQ, seemed opposite

349   behaviours.

350   Michaud [16] applied Principal Component Analysis and Promax rotation while the

351   present study used the Principal Axis Factoring Analysis (PAF) and Promax rotation for EFA.

352   In the PAF the communality estimates on the diagonal of the correlation matrix are iteratively

353   estimated until the iterations converge. Thus, it provides a more robust data extraction and it is

354   widely used in the behavioural and social sciences [33].

355   When the CFA was run, all these items were excluded and item 24 (frequency of using

356   convenience food combined with basic ingredients) (Chart 1) transferred to factor 5 – Cooking

357   Behavior 1 (Figure 2). This change can be explained by the fact that the item referred

358   specifically to cooking from basic ingredients and this item differs from the other behaviors

359   that related to using convenience foods or even, leftovers. Condrasky et al. [25] indicated that

360   one question relating to self-efficacy of cooking with basic ingredients was loaded onto a factor

361   related to the self-efficacy in consumption of fruits and vegetables (0.48).

362   The clarity of this classification is important as it relates to the definition of cooking

363   skills. Cooking basic/fresh ingredients is different from using convenience or ultra-processed

364   foods, the former requires more hands-on, with the latter only requires heating. A distinction

365   made by the current study defines the nature of processed or ultra-processed foods as foods that

366   are less nutrient dense [13].

367   The concept of cooking from scratch and preparing meals from basic or fresh ingredients

368   is one that is prominent in the literature but rarely tackles the issue of people combining

369   processes and ingredients or indeed cooking extra food and using leftovers because they dislike

370   cooking and want to save time [13, 41] or lack food skills [21,42]. The issue of convenience is

371   one that is often overlooked in the existing literature. Given the pressures of studying and being

372   away from home, it is noted that some young adults, such as university students, may fall into

373 less than healthy eating and that they for various reasons do not cook for themselves [8,9,10,43].

374 Therefore, it is helpful for this population to be able to cook from scratch and identify recipes

375 using basic or fresh ingredients. [13,41], increase cooking skills [21,42] and to distinguish

376 benefits from using fewer processed or ultra-processed foods overall.

377 Regarding the behavior of reheating or using leftovers for another meal, a 3-items factor

378 showed good factor loadings and internal consistency (Table 3) and demonstrated good fit

379 indexes (Table 4). It is a possibility that Brazilian university students frequently apply these

380 behaviors when they reheat or use leftovers in a meal. This task differs from that involved in

381 using fresh foods to cook [3,8,9,10].

382 Additionally, loading was consistent when the item related to the use of convenience

383 combined with basic foods (item 24) was excluded (Chart 1; Figure 2; Table 3). It is suggested

384 that cooking from scratch (with fresh and raw ingredients) is being substituted or combined

385 with the use of technology such as with the microwave, for more convenience, mainly by young

386 people. In this sense, the term 'culinary transition', which is a transition in cooking from scratch

387 cooking to using convenience food alone or in combination can be applied. It is noted that

388 convenience food may also employ the need for some cooking skills, even when one is simply

389 heating food to a desired level [1,42].

390 Moreover, people may be preparing meals at home by using leftovers from ready-to-eat

391 meals or convenience foods as well as takeout foods. In terms of the wider issue of domestic

392 economy, it can be argued that people are food combining to save time and energy to devote to

393 other household activities [42]. The use of convenience foods offers freedom from the kitchen

394 for many and particularly for women who disproportionally have a higher burden of work in

395 the home [43, 44]. Short [12] called for a re-evolution of cooking skills to include meal

396 combining and preparation not just cooking from basics, which she saw as antiquated and based

397 on a model which enslaved women to the home and the kitchen.

398   Leftovers may include food from meals, which were eaten away from home, or from

399   meals cooked previouly at home. If cooking is defined as submitting food to heat [12,45];

400   heating leftovers supports this definition which remains unclear in the literature [5,13,7,46].

401   Short noted that there is a new category of skills, which is food combining and food planning

402   which involves a different set of skills and knowledge than that involved in cooking from

403   scratch [12].

404   The high standardized residual correlations found (Table 5) may indicate that tasks

405   related to using leftovers to make a new dish, or trying new recipes or following a recipe, as

406   well as making a meal with items available at home require cooking knowledge. The highest

407   values (>0.1) of standardized residual correlations can show a sense of misfit [47]. However,

408   data showed a good fit index, and these correlations did not influence the final model (Table

409   4).

410   Garcia et al. [46] evaluated the impact of a 6-week community-based cooking program

411   with socioeconomically disadvantaged people (n=112) in Glasgow, UK. They found significant

412   increases in confidence for using leftovers (4 vs. 5, $p = 0.002$) between baseline and post-

413   intervention. Participants also reported eating more leftover foods from "never" to "once a

414   week" at baseline (88%) to "2–4 times a week" to "once a day" at post-intervention (97%).

415   Authors measured the frequency (never to always) in using leftovers which is similar to measure

416   used in this current study in measuring cooking confidence. The participants identified the

417   usage of leftovers as an alternative to save money and reduce food waste and allow them, to

418   plan and prepare more meals. They also claimed that they could freeze or store leftovers as well

419   as make new recipes. Thus, using leftovers may be a reliable indicator of cooking skills

420   (planning and preparing more meals, save time and wasting, making new dishes, etc), because

421   it reflects the ability to procure and prepare food within the social, physical, and economic

422   environment contexts, named as food agency [20].

423   In the present study, the means of the items related to the frequency of using or re-
424   heating leftovers in another meal were higher among students that lived with their parents
425   compared to those that lived alone or with roommates. It appears that when parents are
426   responsible for purchasing the food and preparing home meals students can simply re-heat or
427   use the leftovers in another meal, rather than prepare meals from scratch (Table 7). In a study
428   evaluating self-reported food skills of 6638 students from a Canadian university, those who
429   lived away from home for longer than one year reported greater food skills than those who lived
430   away for less than a year [9].

431   On the other hand, one item related to self-efficacy in cooking from scratch showed
432   strong values in the present study. Self-efficacy in cooking may predict cooking behaviors
433   [5,16]. However, there is lack of evidence that self-efficacy or confidence in cooking may be
434   sufficient to determine the cooking behavior [48]. Despite this, culinary confidence is still
435   considered a good indicator for cooking practices, demonstrating a close relationship with the
436   frequency in preparing meals at home [2,9,16,31,42]. Thus, the item about behavior of cooking
437   from scratch (item 16) could be excluded and thus shorten the BCSQ. It is represented by the
438   item about self-efficacy in cooking from scratch (item 30) (**Chart 1**) as such these items seemed
439   repetitive.

440   The current study also found evidence of convergent and discriminant validity and
441   composite reliability. Although some factors did not present high values of convergent validity,
442   most of them were higher or closer to our cut-off point (>0.5). Factor CA did not meet our cut-
443   off point, but this was the first time this analysis was conducted for this construct [15], and we
444   could find no previous discussion in other similar questionnaires of verification of a similar
445   factor [2,16-24]. Additionally, cooking attitudes showed low validity compared to other scales
446   from the BCSQ because it refers to barriers to cook, such as negative attitudes (e.g. individuals
447   who think cooking is tiring) [15].

448 Based on the comparison between AVE and ASV, all factors presented evidence of

449 discriminant validity (AVE>ASV), but when AVE is compared to MSV some factors did not

450 present such strong evidence (e.g., SEC and SEFVS). A single factor, named *Cooking*

451 *Techniques and Meal Preparation Self-Efficacy*, was extracted by Condrasky et al. [25]. This

452 factor was loaded by items from SEC and SECT scales, but not from SEFVS as seen by

453 Michaud [16] and Jomori et al. [15]. This may be due to the fact that they were theoretically

454 different. The SEC scale relates to the self-efficacy to plan and prepare meals from scratch,

455 follow recipes, etc [15,16, 25]. It is related to food skills, which involve a different set of tasks

456 to be completd before cooking takes place [16,42]. The SEFVS scale is a measure for the use

457 of fruits, vegetables, and seasonings to cook [15,16]. Thus, although the SEC and SEFVS

458 factors did not present AVE> MSV, they did show AVE> ASV (Table 6) and theoretical

459 differences, as previously presented [15,16,25,41], which may support the reasons why both

460 factors can be considered discriminat from the others. Lastly, composite reliability confirmed

461 the evidence of good internal consistency of all of the factors, which indicates that the items are

462 measuring the same construct in each factor [30].

463 In the present study, there no evidence of the influence of amount of time available to

464 cook for the individuals participating on cooking behavior and self-efficacy scales (Table 7).

465 Studies have noted that having to spend time in cooking at home may be considered a barrier

466 to cooking. This notion may lead university students to prefer to consume their meals in the

467 cafeteria setting thus avoiding spending the time necessary to cook for themselves [8,49].

468 Young adults who spent the least amount of time on food preparation tend to prefer to use

469 convenience foods and spent more money on food away from their homes [3,8,11,49]. As

470 mentioned previously, items on the BCSQ related to behaviors about using and re-heating

471 leftovers in another meal, as well as using convenience foods combined with basic ingredients,

472 may further explain why the amount of time available was not an influence.

473 Conversely, available time is an important influence on tasks about cooking from
474 scratch on the SEC scale. [8,9,49]. A study carried out with the BCSQ analysed the relationship
475 between scores from all BCSQ scales and sociodemographic variables of university students.
476 University students with low SECT, SEFVS and SEPC scores were associated with having less
477 than one hour a day to cook (p=0.23, 0.01, and 0.002, respectively). The authors analysed data
478 obtained from SEC and SECT scales bracketed, named the last scale (SECT). This SECT scale
479 was composed by items that evaluated the confidence in cooking from basic ingredients,
480 planning utritious meals, using knife skills, peeling and chopping foods, for example, as well
481 as some cooking techniques, such as, boiling, ster-frying, baking, etc. Higher SECT and SEFVS
482 scores were observed for students who had more than 3 h available per day to cook whereas
483 SEPC scores were higher for students who had 1–3 h to cook [49].

484 In the present study, time spent on cooking had no substantial influence on cooking
485 confidence for students (Table 7) thus it is likely that this dimension does not depend on the
486 barrier so noted as a lack of time or of time pressures. It is possible that within time constraints,
487 there are additional aspects such as the amount of cooking parents do at home and of teaching
488 their children to cook. This seems like a negative influence on cooking confidence of university
489 students [48].

490 Factors 3 (SEPC) and 4 (CA) mimicked the original measure [16,25], but the current
491 study excluded 3 items from factor 4 (Figure 2; Table 3), due to the low factor loadings (<0.5)
492 and the high correlations (r>0.7).

493 The positive cooking attitudes items were primarily validated in the original
494 questionnaire (factor loading >0.40) [16]. This measure in the Brazilian version had indicated
495 low internal consistency [15], and now displaying good values when items on the preparation
496 of healthy meals and affordability of cooking were excluded (Figure 2; Table 3).

497   Negative cooking attitudes, which represented most of the items within this factor, were

498   about time-spent to cook (Figures 2; Table 3). One explanation could be that there was no

499   influence on the CA scale by the amount of time available to cook (Table 7). The willingness

500   to cook for university students within the present study seemed to depend more on their

501   reporting of knowing how to cook and if they live with parents than the time available to cook

502   rather than the time available itself, as reported in other studies [9,48]. Other aspects such as

503   resources (easy access to food), as well as family schedule and engagement are related to

504   negative perceptions about the time, which can play a role on the students' cooking motivation

505   [48].

506   The items about self-efficacy for using unprocessed fruits, vegetables (green), and root

507   vegetables (i.e. potatoes) (**Chart 1**) are difficult to interpret. For those individuals that cook in

508   Brazil they generally prepare potatoes and green vegetables from scratch. Food guidelines in

509   Brazil consider raw or fresh vegetables to be healthier than ultra processed foods [13,50].

510   The results of the validation research on the CWC questionnaire in South Carolina for

511   the CWC program demonstrated good loadings for items about self-efficacy in using

512   vegetables, fruits, and herbs [13,25]. Condrasky et al. [25] extracted 3 factors, where these items

513   were loaded onto the factor about *Cooking Techniques and Meal Preparation Self-Efficacy*.

514   However, items about self-efficacy for using spices, vinegars and hot sauces items were not

515   validated in this study [16,25].

516   In the present study, the item related to self-efficacy when cooking green vegetables

517   (items 49 – **Chart 1;** Figure 2) was excluded as it showed low factor loading (Table 2), as did

518   the items about spices and hot sauces with high correlation (r>0.8). These specific seasonings

519   require little or no handling and may be associated with specific cooking techniques related to

520   cooking (heating food) and not to scratch cooking [13].

521   The current study excluded an entire factor (with 6 items) on self-efficacy that was

522   concerned with the use of specific cooking techniques (**Chart 1**). Even though these items

523   demonstrated good factor loadings for items and internal consistency after EFA was run, it was

524   not used. The rationale for the exclusion was that the SECT measure could detect differences

525   between high and low levels of cooking knowledge (≥ 6 points and < 6points, respectively) but

526   not between genders in the process of construct validity by the known-groups method within

527   Brazilian university students [15]. No differences between genders in confidence of using

528   cooking techniques were found by Caraher et al. [1] and Hartmann et al. [2]. It appears that

529   specific cooking techniques are influenced by cooking knowledge among university students

530   but are not by gender specific. Cooking techniques' knowledge has already been evaluated by

531   BCSQ [15], therefore it was judged unnecessary to evaluate the self-efficacy in using specific

532   cooking techniques in young adults, but to focus on knowledge of how to use them and to

533   exclude the SECT scale. However, for specific population, the SECT can be used, for example,

534   cooks and chefs, when it is necessary to evaluate the confidence in using these techniques, in

535   addition to their cooking knowledge [28].

536   The second reason for excluding SECT scale refers to the choice of which cooking

537   techniques are essential to evaluate cooking skills in each demographic of young adults. The

538   item self-efficacy in using basic cooking techniques showed good factor loading (0.53) onto

539   the factor related to other cooking techniques in the study carried out by Condrasky et al. [25].

540   Within the BCSQ administration, researchers presented examples to the paticipants for specific

541   techniques (e.g. washing, peeling, chopping) These cooking technique examples were then

542   maintained in the SEC scale (**Chart 1**). Another cooking technique that was added to this scale

543   was 'boiling' which had been excluded from the SECT [15,16]. With these changes, the current

544   study prioritized its evaluation of self-efficacy in cooking from scratch as mentioned by others

545   [13,7,41,42], instead of maintaining all SECT items in the measure.

546   Finally, some cooking techniques presented in SECT scale were considered unhealthy,

547   such as deep-frying, but participants of previous studies have usually employed it to cook

548   [25,27]. However, these cooking techniques is not recommended to compose the health

549   practices, as a proposed construct for BCSQ. Raber et al. [14] have provided a conceptual model

550   for healthy cooking behaviors. The authors identified within their systematic review that some

551   studies, excluded cooking techniques or food processing which apply high temperatures, such

552   as roasting and barbecuing, mainly in meats from healthy cooking techniques listing. It is noted

553   that in some cooking processes these techniques have been implicated as potential contributors

554   to risk factors for certain diseases. Deep-frying, as it contributes to fat intake is not considered

555   a healthy cooking technique [14,28]. However, many cooking techniques can be useful to

556   prepare healthy meals, such as boiling, simmering, steaming, poaching, broiling, grilling

557   [14,28]. These techniques depend on the care taken in reducing reliance on using

558   certainingredients (convenience /ultra-processed foods with low-nutrient and energy-density)

559   and on the addition or replacement of ingredients such as fresh fruits, vegetables and herbs to

560   related to them as part of healthy cooking methods [13,14,31]. The BCSQ intended to evaluate

561   cooking skills and healthy eating aspects, and that the use of various cooking techniques would

562   depend on the kind of food being used. Thus, the authors chose to exclude the SECT in this

563   evaluation, even with high factor loadings, to make the BCSQ shorter.

564

565   **Strengths and limitations**

566   To the best of the knowledge of the research team, this is the first cooking skills

567   questionnaire that has been validated in Brazil that provides an extensive psychometric

568   propriety analysis, supported by healthy eating constructs. The work within EFA and CFA

569   together provides evidence for an improved structure for the BCSQ, that could support the

570   evaluations and cooking skills linked to healthy eating practice constructs. The theoretical

571 constructs include confidence in cooking from scratch with unprocessed foods and in using and

572 eating fruits and vegetables [13,25] which were not seen in any other cooking skills

573 measurement tool.

574 The confirmatory factor analysis using the five-factor proposed by this study, the fit

575 models, and the analysis of the correlation were able to shorten the BCSQ and make it easier to

576 administer and reduce the cost in future use with young adults. High correlations showed that

577 some items appeared to the team as redundant. Thus, excluding them did not cause any effect

578 to the final model and its fit indexes, as well as the standard residual correlations have supported

579 the maintenance of many items that were controversial.

580 The results showed that items related to use of leftovers provides a basis for which to

581 evaluate cooking behaviors, not seen in other studies. Moreover, negative cooking attitude

582 seemed more appropriate for reaching at the cooking skills of this population. This shortened

583 version of BCSQ presents an evaluation of barriers to preparing meals by young adults.

584 It is important to notice that the BCSQ was validated with college aged young adults in

585 a single university in Brazil. The university studied has students from all regions of the country

586 which increases its diversity. From other research the researchers believe that most young adults

587 cooking skill that can be evaluated by this measurement may also fit to other age groups such

588 as adults. For this work there may need to be some modifications to account for various taste

589 profiles and by regional culture.

590 The exclusion of the SECT scale was a calculated decision by the authors. The

591 researchers relied on evidence on cooking skills from the recent literature rather than solely on

592 the factor loadings and internal consistency. This decision allowed the goal of shortening the

593 questionnaire to be accomplished. This decision does not mean that other studies can not use

594 this scale to complement the evaluation as long as it is used to test specifically the levels of

595 cooking knowledge.

CONCLUSIONS

This research has contributed to the development of an appropriate, robust, and shortened version of a tool to be used to evaluate cooking skills and healthy eating practices of young adults. Beside the healthy eating constructs, the shortened BCSQ identifies barriers to preparing meals by young adults, such as negative attitudes as well as the frequency of using leftovers to cook. This research will help support researchers and health professionals who work to design future healthy eating tools and interventions.

It is recommended that the questionnaire presented in this study be tested with other adult populations. It is also suggested that other studies that develop cooking skills construct questionnaires could adopt the methodology used in the present study and aim to establish homogenous measurements that can further compare and strengthen the results.

Author Contributions

MMJ was responsible for designing the research, collecting, analysing, and interpreting the data, and for writing the manuscript. RTQ contributed to the design of the study, data analysis, interpretation of results and manuscript review. MDC contributed to the description of the measurement, the discussion, and the manuscript review. MC contributed for the design of the study, literature, and manuscript review, as well as for the choice of the journal. All the authors approved this version for publication and accepted the conditions established by the *Nutrition*.

References

1. Caraher, M., Dixon, P., Lang T. & Carr-Hill, R. (1999) The state of cooking in England: The relationship of cooking skills to food choice. *British Food Journal, 101*, 590-609. doi: 10.1108/00070709910288289

2. Hartmann, C., Dohle, S. & Siegrist, M. (2013). Importance of cooking skills for balanced food choices. *Appetite, 65*, 125-131.

3. Munt, A. E., Partridge, S. R. & Allman-Farinelli, M. (2016). The barriers and enablers of healthy eating among Young adults: a missing piece of the obesity puzzle: A scoping review. *Obesity Reviews*, *18* (1), 1-17. doi: 10.1111/obr.12472

4. Reicks M., Kocher, M. & Reeder, J. (2018). Impact of cooking and home food preparation interventions among adults: A Systematic Review (2011–2016). *Journal of Nutrition Education and Behavior*; 50:148–172. doi: 10.1016/j.jneb.2017.08.004

5. Asher RC, Jakstas T, Wolfson JA, Rose AJ, Bucher T, Lavelle F, Dean M, Duncanson K, Innes B, Burrows T, Collins, C.E. & Shrewsbury, V.A. (2020). Cook-Ed^{TM}: A Model for Planning, Implementing and Evaluating Cooking Programs to Improve Diet and Health. *Nutrients*, *12*, 2011-31. doi:10.3390/nu12072011

6. Jones, S., Walter, J., Soliah, L. & Phifer, J.T. (2014). Perceived motivators to home food preparation: focus group findings. *Journal of the Academic of Nutrition Dietetic, 114*, 1552–1556. doi: 10.1016/j.jand.2014.05.003

7. Wilson, C. K., Matthews, J. I., Seabrook, J.A., Dworatzek, P. D. N. (2017). Self-reported food skills of university students. *Appetite*, *108*, 270-276. doi: 10.1016/j.appet.2016.10.011

8. Warmin, A., Sharp, J. & Condrasky, M.D. (2012) Cooking with a Chef: a culinary nutrition program for college aged students. *Topical in Clinical Nutrition, 27*, 164-173. DOI: 10.1097/TIN.0b013e3182542417

9. Monsivais, P.; Aggarwal, A.; Drewnowski, A. (2014). Time Spent on Home Food Preparation and Indicators of Healthy Eating. *American Journal of Preventive Medicine*, *47*(6):796–802. doi: 10.1016/j.amepre.2014.07.033

10. Sprake, E. F., Russell, J. M., Cecil, J. E., Cooper, R. J., Grabowski, P, Pourshahidi, L. K. & Barker, M. E. (2018). Dietary patterns of university students in the UK: a cross-sectional study. *Nutrition Journal*, *17*, 1-19. https://doi.org/10.1186/s12937-018-0398-y

11. Lavelle, F., Mcgowan, L., Spence, M., Caraher, M., Raats, M.M., Hollywood, L., McDowell, D., McCloat , A., Mooney, E. & Dean, M. (2016). Barriers and facilitators

649   to cooking from 'scratch' using basic or raw ingredients: A qualitative interview study.
650   *Appetite*, *107*, 383-391. doi: 10.1016/j.appet.2016.08.115

651 12. Short F. (2003) Domestic cooking practices and cooking skills: findings from an English
652   study. *Food Service and Technology*, *3*, 177–85. http://dx.doi.10.1111/j.1471-
653   5740.2003.00080.x

654 13. Jomori, M.M, Vasconcelos, F.A.G., Bernardo, G.L., Uggioni, P.L.; Proença, R.P.C.
655   (2018). The concept of cooking skills: a review with contributions to the scientific
656   debate**.** Revista de Nutrição**,** 31, 119-135. https://doi.org/10.1590/1678-
657   98652018000100010

658 14. Raber, M., Chandra, J., Upadhyaya, M., Schik, V., Strong, L.L., Durand, C. & Sharma,
659   S. (2016). An evidence-based conceptual framework of health cooking. *Preventive*
660   *Medicine Reports*, *4*, 23-28. doi: 10.1016/j.pmedr.2016.05.004

661 15. Jomori, M.M., Proença, R.P.C., Echevarria-
662   Guanilo, M.E., Bernardo, G.L., Uggioni, P.L. & Fernandes, A.C. (*2017).*
663   Construct validity of Brazilian cooking skills and healthy eating questionnaire by
664   the known-groups method*. British Food Journal, 119,* 1003-1016.
665   http://dx.doi.org/10.1108/BFJ-10-2016-0448

666 16. Michaud, P. (2007). *Development and evaluation of instruments to measure the*
667   *effectiveness of a culinary and Nutrition education program*. Master Thesis, Clemson
668   University.

669 17. Barton, K.L., Wrieden, W.L. & Anderson, A.S. (2011). Validity and reliability of a short
670   questionnaire for assessing the impact of cooking skills interventions. *Journal of Human*
671   *Nutrition and Dietetic*, *24*, 588-595. doi: 10.1111/j.1365-277X.2011.01180.x

672 18. Costa, A.I.A. (2013). Conceptualization and measurement of personal norms
673   regarding meal preparation. *International Journal of Consumer Studies*, *37*, 596-604.
674   https://doi.org/10.1111/ijcs.12036

675 19. Miketinas, D., Cater, M., Bailey, A., Craft, B. & Tuuri, G. (2016). Exploratory and
676   confirmatory factor analysis of the Adolescent Motivation to Cook Questionnaire: A
677   Self-Determination Theory Instrument. *Appetite* 105, 527-533.
678   https://doi.org/10.1016/j.appet.2016.06.024

679 20. Lahne, J., Wolfson, J.Á. & Trubek, A. (2017). Development of the Cooking and Food
680   Provisioning Action Scale (CAFPAS): A new measurement tool for individual
681   cooking practice. *Food Quality and Preference,* 62, 96-105. doi:
682   10.1016/j.foodqual.2017.06.022

683 21. Lavelle, F., McGowan, L, Hollywood, L., Surgenor, D., McCloat , A., Mooney, E.
684   Caraher, M., Raats, M.M. & Dean, M. (2017). The development and validation of
685   measures to assess cooking skills and food skills. *International Journal of Behavioral*
686   *Nutrition and Physical Activity, 14*(1), 118. doi:10.1186/s12966-017-0575-y

687 22. Bailey, A.D.L., Cater, M., O'Neil, C.E., Miketinas, D. & Tuuri, G. (2019).
688   Psychometric Analyses of the Motivation to Prepare Healthy Foods Questionnaire
689   Used With Adult College Students. *Journal of Nutrition Education and Behavior*. *51*,
690   456-464. https://doi.org/10.3389/fpsyg.2015.00898

691 23. Kennedy, L.G., Kichler, E. J., Seabrook, J. A., Matthews, J.I. & Dworatzek, P. D.N.
692   (2019). Validity and Reliability of a Food Skills Questionnaire. *Journal Nutrition*
693   *Education and Behav*ior, *51*, 857−864. doi: 10.1016/j.jneb.2019.02.003

     24. Martins, C.A., Baraldi, L.G., Scagliusi, F.B., Villar, B.S., Monteiro, C.A. (2019).
     Cooking Skills Index: Development and reliability assessment. *Revista de Nutrição,*
     32: e180124. doi: 10.1590/1678-9865201932e180124.

694 25. Condrasky, M. D., Williams J. E, Catalano P. M. & Griffin, S.F. (2011). Development
695 of psychosocial scales for evaluation the impact of a Culinary Nutrition Education
696 program on cooking and healthful eating. *Journal of Nutrition Education and Behavior,*
697 *43*, 511-516. doi: 10.1016/j.jneb.2010.09.013

26. Hair, J. F., Black, W., Babin, B., & Anderson, R. E. (2014). *Multivariate data analysis*
New Jersey: Pearson.

698 27. Jomori, M.M, Caraher, M, Bernardo, G.L, Uggioni, P.L, Echevarria-Guanilo, M.E,
699 Condrasky, M, Proença, R.P.C. How was the Cooking Skills and Healthy Eating
700 Evaluation Questionnaire culturally adapted to Brazil? *Ciência & Saude Coletiva, 26,*
701 2379-93. doi: 10.1590/1413-81232021266.22102019

702 28. Condrasky, M. D., Baruth, M., Wilcox, S., Carter, C. & Jordan, J. F. (2013). Cooks
703 training for Faith, Activity, and Nutrition project with AME churches in SC. *Journal of*
704 *Evaluation and Program Planning*, *37*, 43-49. doi: 10.1016/j.evalprogplan.2012.11.002

705 29. Kerrison, D. A., Condrasky, M. D. & Sharp, J. L. (2017). Culinary nutrition education
706 for undergraduate nutrition dietetics students. *British Food Journal*, *119*, 1045- 1051.
707 http://dx.doi.org/10.1108/BFJ-09-2016-0437
708 30. Streiner DL, Norman GR, Cairney J. 5th Ed. *Health Measurement Scales – A*
709 *Practical Guide to their Development and use*. New York: Oxford University Press,
710 2015.
711 31. Bernardo, G.L., Jomori, M.M., Fernandes, A.C., Colussi, C.F., Condrasky, M.D.
712 & Proença, R.P.D.C. (2018). Positive impact of a cooking skills intervention among
713 Brazilian university students: Six months follow-up of a randomized controlled trial.
714 *Appetite*,*130*: 247-255. doi: 10.1016/j.appet.2018.08.014.
715 32. Wrieden, W.L., Anderson, A.S., Longbottom, P.J., Stead, V.K., Caraher, M., Lang, T.,
716 Gray, B. & Dowler, E. (2007). The impact of a community-based food skills
717 intervention on cooking confidence, food preparation methods and dietary choices – an
718 exploratory trial, *Public Health Nutrition, 10*, 203-211.
719 doi:10.1017/S1368980007246658
720 33. Thompson, B. (2004). Exploratory and confirmatory factor analysis: understanding
721 concepts and applications. Washington: American Psychology Association.
722 https://doi.org/10.1037/10694-000

34. IBM Corporation. *IBM SPSS Statistics for Windows*, Version 20.0.IBM Corp.:Armonk,
NY, 2011.

723 35. Kline, R. B. (2016). *Principles and Practice of Structural Equation Modeling*. New
724 York: The Guilford Press.
725 36. Jackson, D., Gillaspy Jr, J. A. & Purc-Stephenson, R. (2009). Reporting practices in
726 confirmatory factor analysis: An overview and some recommendations. *Psychological*
727 *methods, 14*(1), 6. doi: 10.1037/a0014694
728 37. Rosseel, Y. (2012). Lavaan: An R package for structural equation modeling and more.
729 Version 0.5–12 (BETA). *Journal of statistical software, 48*(2), 1-36. doi:
730 10.18637/jss.v048.i02
731 38. R Core Team. (2018). R: A Language and Environment for Statistical Computing.
732 39. Gelman, A. & Hill, J. (2007). *Data analysis using regression and*
733 *multilevel/hierarchical models* Cambridge: Cambridge University Press.
734 40. Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects
735 Models Using lme4. *Journal of statistical software, 67*(1), 48. doi:
736 10.18637/jss.v067.i01

737 41. Wolfson, J.A., Bleich, S.N., Smith, K.C. & Frattaroli, S. (2016). What does cooking
738   mean to you?: Perceptions of cooking and factors related to cooking behavior *Appetite*
739   *97*, 146-154. doi: 10.1016/j.appet.2015.11.030

42. McGowan, L, Caraher, M., Raats, M., Lavelle, F., Hollywood, L., McDowell, D.,
    Spence, M., McCloat, A., Mooney, E. & Dean, M. (2017). Domestic cooking and food
    skills: A review. *Critical Reviews in Food Science and Nutrition,* 57: 2412-31. doi:
    10.1080/10408398.2015.1072495

43. Santos, S., Vilela, S., Padrão, P. & Caraher, M. (2015). Sex-related dietary changes of
    Portuguese university students after migration to London, UK. *Nutrition & Dietetics,*
    72, 340-346.

44. Alm, S. & Olsen, S.O. (2017). Coping with Time Pressure and Stress: Consequences
    for Families, Food Consumption. *Journal of Consumer Policy*, *40*, 105-23. DOI
    10.1007/s10603-016-9329-5

45. Begley, A. & Gallegos, D. (2010). What's cooking for dietetics? A review of the
    literature. *Nutrition and Dietetics*, 67, 26-30. doi: 10.1111/j.1747-0080.2010.01406.x

46. Garcia, A.L. Reardon, R., Hammond, E., Parrett, A. & Gebbie-Diben, A. (2017).
    Evaluation of the "Eat Better Feel Better" Cooking Programme to Tackle Barriers to
    Healthy Eating *International Journal of Environmental Research and Public Health*,
    14, 380-98. doi: 10.3390/ijerph14040380

47. Hallquist, M. (2019). *SEM Fit and Modification. Introduction to PSY 597: Structural
    Equation Modeling* [Course]. Retrived from: https://psu-psychology.github.io/psy-597-
    sem-sp2019/08_fit/sem_fit_modification.html#

740 48. Murray, D.W., Mahadevan, M., Gatto, K., O'Connor, K., Fissinger, A., Bailey, D. &
741   Cassara, E. (2016). Culinary efficacy: an exploratory study of skills, confidence, and
742   healthy cooking competencies among university students. *Perspectives in Public
743   Health*, *136*, 143-151. doi: 10.1177/1757913915600195

744 49. de Borba, T.P., da Silva, M.V., Jomori, M.M., Bernardo, G.L., Fernandes,
745   A.C., Proença, R.P.d.C., Rockenbach, G. & Uggioni, P.L. (2021). Self-efficacy in
746   cooking and consuming fruits and vegetables among Brazilian university students: the
747   relationship with sociodemographic characteristics. *British Food Journal*, *ahead-of-
748   print*. https://doi.org/10.1108/BFJ-04-2020-0311

749 50. Monteiro, C., Levy, R., Claro, R., De Castro, I., & Cannon, G. (2010). Increasing
750   consumption of ultra-processed foods and likely impact on human health: Evidence
751   from Brazil. *Public Health Nutrition, 14*, 5-13. doi:10.1017/S1368980010003241

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754 **Chart 1.** Description of the items from the Brazilian Cooking Skills and Healthy Eating

755 Questionnaire – BCSQ.

Brazilian Cooking Skills and Healthy Eating Questionnaire - BCSQ	
Scales	**Items***
AAFV	**Please mark YES or NO for EACH question**
1.	Was there 100% natural fruit juice (READY OR homemade, including fruit pulp) in your home last week?
2.	Was there fresh fruit in your home last week?
3.	Were there raw or cooked vegetables and greens in your home last week?
4.	Was there leaf vegetables to salad in your home last week?
5.	In the last week, were fruit, vegetables and greens visible somewhere in the kitchen?
6.	In the last week, were there 100% natural fruit juice (READY OR homemade, including fruit pulp) or fresh fruits visible IN the refrigerator to be easly used as a snack?
7.	In the last week, were there PRE-PREPARED fresh vegetables and greens and visible IN the refrigerator to be easily used as snack?
8.	In the last week, were there ready vegetables and greens in the refrigerator to be used in a meal?
CA	**Indicate the extent to which you agree or disagree with the following statements**
9.	I do not like to cook because it takes too much my time.
10.	Meals made at home are affordable
11.	Cooking is frustrating
12.	I like testing new recipes
13.	Cooking is tricky
14.	Making meals at home helps me to eat in a healthier way
15.	Cooking is tiring
CB	**How often did you do the following?**
16.	Prepare meals with basic ingredients (e.g. whole lettuce, raw meat, etc)
17.	Prepare meals using pre-prepared/prepared foods (e.g. leaf vegetables ready to eat, canned corn, grated carrots, roast chicken)
18.	Reheat or use leftovers to eat in another meal
19.	Eat breakfast away from home
20.	Reheating leftovers from a home cooked lunch or dinner meal
21.	Reheating leftovers from a ready meal bought away from home to eat at lunch or dinner meal in home
22.	Using leftovers from a home cooked meal to make a new dish
23.	Using leftovers from a ready meal bought away from home to make a new dish
24.	Using fresh and pre-prepared/prepared items in combination to prepare a home meal (e.g. ready-to-eat leaf vegetables' salad with home cooked meat)
25.	Eat lunch away from home
26.	Eat dinner away from home
SEPC	**Indicate the extent to which you feel confident about performing the following activities:**
27.	Eat fruits, vegetables and greens every day at lunch and dinner

28.	Eat fruits or vegetables and greens as a snack, even if everybody else were eating other snacks
29.	Eat the recommended 3 servings of fruits, and 3 of vegetables and greens every day
SEC	**Indicate the extent to which you feel confident about performing the following activities:**
30.	Cook from unprocessed ingredients (ex: lettuce head, fresh tomatoes, raw meat)
31.	Follow a written recipe (ex: preparing *vinagrete* sauce with tomatoes, onion, bell pepper, vinars, olive oil, salt peppers)
32.	Prepare dinner with items you have in the moment in your home
33.	Use knife with skills in the kitchen.
34.	Plan nutritious meals.
35.	Use pre-preparation culinary techniques (e.g. washing, peeling, chopping)
SECT	**Indicate the extent to which you feel confident about performing the following activities:**
36.	Cooking in boiling water
37.	Simmering
38.	Steaming (steam-cook)
39.	Frying with a large amout of oil
40.	Sautéing
41.	Braising
42.	Broiling
43.	Poaching/Scalding
44.	Baking/Roasting (is the same in Portuguese)
45.	Barbecuing/Grilling
46.	Stewing
47.	Using the micro-wave oven
SEFVS	**Indicate the extent to which you feel confident about performing the following activities:**
48.	Fresh or frozen vegetables and greens (ex: broccoli, pea)
49	Root vegetables and tubers (ex: potatoes, beets, sweet potatoes)
50	Fruits (ex: orange, watermelon)
51.	Herbs (ex: parsley, spring onion)
52.	Spices (e.g. pepper, cinnamon)
53.	Vinegars
54.	Juice of citrus fruits
55.	Zest of citrus fruits
56.	Hot sauces (e.g. pepper sauces, mustard sauce)
CTT	**Select ONE answer for EACH question:**
57.	Cooking potatoes briefly in boiling water and, following, put in cold water to preserve them for long time OR avoid their browning is an example of which culianry technique below?
58.	If a recipe asks you to sauté an onion, you should cook it:
59.	A diced potato should be cut into:
60.	Water is simmering when:
61.	Sweet potatoe is roasted when it is:
62.	What is the term used (designated) for washing, peeling and slicing foods before beginning to cook?
63.	To precisely measure 1 cup of milk for this recipe:

| 64. | Which is best utensil for precisely measuring the honey in this recipe? | | |

Table 1. Description of the Brazilian Cooking Skills and Healthy Eating Questionnaire – BCSQ.

Brazilian Cooking Skills and Healthy Eating Questionnaire - BCSQ			
Scales	**What it measure?**	**Items**	**Answers / score**
1. **Availability and Accessibility of Fruits and Vegetables Index - AAFV [15,16]**	The availability of fruits and vegetable over the past week	8	Yes/no (1 or 2 points)
2. **Cooking Attitude - CA [10,15,16,25]**	How respondents felt about cooking	7	5-point Likert scale (from "strongly disagree" to "strongly agree")
3. **Cooking Behavior - CB [15,16, 28, 31, 32]***	The frequency of common cooking activities	11	11-items (from "not at all" to "about every day")
4. **Produce Consumption Self-Efficacy - SEPC [15,16]**	The degree of confidence in being able to meet the government's three Brazilian recommendations for the consumption of fruits and vegetables	3	5-point Likert scale (from "not at all confident" to "extremely confident")
5. **Self-Efficacy in Cooking – SEC [15,16]**	The degree of confidence in performing basic meal preparation activities	6	
6. **Self-Efficacy in Using Basic Cooking Techniques – SETC [15,16]**	The degree of confidence in specific cooking techniques	12	
7. **Self-Efficacy for Using Fruits, Vegetables, and Seasonings – SEFVS [15,16]**	The degree of confidence in using fruits and vegetables when cooking	9	
8. **Knowledge of Cooking Terms and Techniques Evaluation (CTT) [15,16, 27]**	The level of cooking knowledge	8	Multiple-choice answers (1 point for the correct answer) Low CK - <6 points High CK - ≥6 points
	Total	**64**	Lower to higher mean

*Items with low loading and internal consistency [15,16]

CK = Knowledge of Cooking

Table 2. Sociodemographic characteristics of Brazilian university students (n=767).

Characteristics	Values
Sex (%)	
Female	59.6
Male	40,4
Age (mean, SD)	20.7 (±5.59)
Ethnicity (%)	
White	84.5
Black	9.2
Other	6.3
Income*(%)	
Low	15.4
Other	84.6
Living arrangements (%)	
With parents/grandparents	44.6
With friends or parrner or other	35.5
Alone	19.9
Children (%)	
Yes	96.9
No	3.1
Courses (%)	
Full-time	52.9
Part-time	47.1
Location of the main meal	
Home	49.0
Outside	51.0
Reporting that know how to cook (%)	
Yes	72.0
No	28.0

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Table 3. Exploratory Factor Analysis and Reliability Estimates of the BCSQ (n=767) [a].

Items and correspondent BCSQ scales	Factor loadings					
	1	**2**	**3**	**4**	**5**	**6**
Cronbach- α	0.86	0.89	0.81	0.77	0.77	0.62
SEC-Self-Efficacy in Cooking (7 items) - *How confident do you feel in:*						
30. Cook from basic ingredients (ex: whole head of lettuce, fresh tomatoes, raw meat)	0.72					
31. Follow a written recipe (ex: preparing *vinagrete* sauce with tomatoes, onion, bell pepper, vinars, olive oil, salt peppers)	0.56					
32. Prepare dinner with items you have in the moment in your home	0.66					
33. Use knife with skills in the kitchen.	0.71					
35. Use basic cooking techniques (e.g. washing, peeling, chopping)	0.71					
36. Cooking in boiling water	0.77					
37. Simmering	0.76					
SEFVS-Self-Efficacy in Using Fruits, Vegetables and Seazonings (9 items) - *How confident do you feel in using:*						
48.Fresh or frozen vegetables and greens (ex: broccoli, pea)			0.43			
50. Fruits (ex: orange, watermelon)		0.31	0.45			
51. Herbs (ex: parsley, spring onion)		0.52				
52. Spices (e.g. pepper, cinnamon)		0.77				
53. Vinars		0.70				
54. Juice of citrus fruits		0.68				
55. Zest of citrus fruits		0.70				
56. Hot sauces (e.g. pepper sauces, mustard sauce)		0.76				
SEPC-Produce Consumption Self-Efficacy (3 items) - *How confident do you feel in:*						
27. Eat fruits, vegetables and greens every day at lunch dinner			0.86			
28. Eat fruits or vegetables and greens as a snack, even if everybody else were eating other snacks			0.79			
29. Eat the recommended 3 servings of fruits, and 3 of vegetables and greens every day			0.80			
CA- Cooking Attitude (5 items) - *How much do you agree or disagree with statements bellow:*						
9. I do not like to cook because it takes too much my time.				0.63		
11. Cooking is frustrating.				0.57		
12. I like testing new recipes.				0.34		
13. Cooking is tricky.				0.66		
15. Cooking is tiring.				0.79		
CB 1 - Cooking Behavior related to use of leftovers (3 items) - *How frequent do you:*						
18. Reheat or use leftovers to eat in another meal					0.80	
20. Reheat leftovers from a home cooked lunch or dinner meal					0.93	

22. Use leftovers from a home cooked meal to make a new dish		0.42

CB 2 - Cooking Behavior related to cooking from scratch or convenience food (3 items) - *How frequent do you:*

16. Prepare meals with basic ingredients (e.g. whole lettuce, raw meat, etc)	0.32	0.40
17. Prepare meals using pre-prepared/prepared foods (e.g. leaf vegetables ready to eat, canned corn, grated carrots, roast chicken)		0.64
24. Use fresh and pre-prepared/prepared items in combination to prepare a home meal (e.g. ready-to-eat leaf vegetables' salad with home cooked meat)		0.75

Notes: BCSQ: Brazilian Cooking Skills and Health Eating Questionnaire.
[a] Principal Axis Factoring method with Promax rotation (extraction eigenvalues > 1 and scree test).

Table 4. Confirmatory factor analysis fit indexes.

	X^2	df	X^2/df	CFI	TLI	NFI	RMSEA	GFI	ECVI	SRMR
M1	1690.505	362	4.66	0.855	0.838	0.824	0.069	0.866	2.394	0.061
M2	1088.966	265	4.11	0.892	0.878	0.862	0.064	0.894	1.576	0.059
M3	825.076	220	3.75	0.913	0.900	0.885	0.060	0.911	1.222	0.052
M4	499.460	170	2.94	0.940	0.929	0.914	0.053	0.938	0.782	0.046

M1 = Model 1 / M2 = Model 2 / M3 = Model 3 / M4 = Model 4
X^2 = chi-square; df = degree of freedom;X^2/df = adjusted chi-square; CFI = Comparative Fitness Index; TLI = Tucker–Lewis Index; NFI = Normed fit index; RMSEA =Root Mean Square of Error of Approximation; GFI = Goodness of Fit Index; ECVI = Expected Cross-validation Index; SRMS = Standardized Root-mean-square residual.

Table 5. Standardized residuals correlations matrix

	9	11	12	15	18	20	22	27	28	29	30	31	32	33	35	36	48	50	51	53
9	0.000																			
11	-0.013	0.000																		
12	-0.019	-0.004	0.000																	
15	0.052	0.014	-0.042	0.000																
18	0.006	-0.007	0.031	-0.048	0.000															
20	0.021	-0.014	0.020	0.047	0.001	0.000														
22	**0.129**	0.037	**0.113**	0.031	-0.006	-0.001	0.000													
27	-0.041	-0.021	-0.034	-0.018	-0.015	-0.034	0.049	0.000												
28	0.008	0.013	0.012	0.067	0.012	0.028	0.066	-0.017	0.000											
29	-0.046	0.019	0.002	0.040	0.000	-0.013	0.046	-0.002	0.019	0.000										
30	-0.022	0.013	0.063	-0.061	0.016	0.030	0.053	0.092	0.099	0.068	0.000									
31	0.036	0.003	**0.173**	-0.041	-0.015	0.026	0.030	-0.045	0.027	-0.019	0.066	0.000								
32	0.011	0.032	0.045	-0.022	0.040	0.050	**0.103**	-0.109	-0.020	-0.070	0.016	0.013	0.000							
33	-0.020	0.004	0.045	-0.049	-0.074	-0.075	0.043	-0.068	-0.030	-0.013	-0.062	-0.006	0.007	0.000						
35	-0.058	-0.025	0.033	-0.016	-0.034	-0.026	0.091	-0.030	0.029	0.023	-0.020	-0.070	-0.009	0.084	0.000					
36	0.001	-0.032	0.037	-0.018	-0.014	-0.025	0.032	0.023	-0.018	-0.014	-0.019	-0.020	-0.016	0.028	0.011	0.000				
48	-0.032	0.041	0.022	-0.038	0.014	0.004	0.063	**0.124**	0.051	0.014	0.063	-0.023	-0.081	**-0.115**	-0.043	-0.031	0.000			
50	-0.097	-0.065	-0.013	-0.072	-0.022	-0.052	0.067	0.089	0.091	0.050	-0.039	-0.090	-0.025	-0.088	-0.001	0.010	0.010	0.000		
51	0.023	0.031	0.092	-0.016	0.029	0.032	0.085	-0.049	-0.086	-0.085	0.063	0.053	0.014	-0.027	0.062	0.063	-0.026	0.004	0.000	
53	0.015	0.022	0.067	0.016	-0.043	-0.070	0.065	-0.050	-0.049	-0.067	0.026	0.029	-0.016	0.053	0.023	0.020	0.005	-0.048	0.053	0.000

****In bold** = high correlation (>0.1)

Table 6. Convergent validity, discriminant Validity, and composite reliability of the BCSQ.

	AVE	ASV	MSV	CR
CA	0.42	0.14	0.40	0.74
CB	0.57	0.02	0.03	0.79
SECP	0.59	0.13	0.46	0.81
SEC	0.48	0.23	0.56	0.84
SEFVS	0.46	0.28	0.56	0.77

Notes: BCSQ = Brazilian Cooking Skills and Healthy Eating Questionnaire / AVE= average variance extracted; ASV= average shared squared variance; MSV = Maximum shared squared variance; CR = Composite reliability; SEC = Self-Efficacy in Cooking / SEFVS = Self-Efficacy in Using Fruits, Vegetables and Seasonings / SEPC = Produce Consumption Self-Efficacy / CA = Cooking Attitude / CB = Cooking Behaviour

Table 7. Estimates of the BCSQ scales related to sex, living arrangements, knowing how to cook, place of main meal and time to cook at home (n=767)[a].

	CA	CB	SEPC	SEC	SEFVS
Estimates (95% CI)					
Gender					
Female	3.58 (3.58 to 3.58)	3.29 (3.10 to 3.48)	3.04 (2.93 to 3.23)	3.74 (3.63 to 3.85)	3.30 (3.10 to 3.50)
Male	3.58 (3.58 to 3.58)	3.09 (2.90 to 3.28)	3.12 (3.01 to 3.24)	3.65 (3.54 to 3.76)	3.49 (3.29 to 3.69)
Living					
Alone	3.57 (3.51 to 3.63)	3.08 (2.90 to 3.27)	3.07 (3.01 to 3.14)	3.75 (3.63 to 3.88)	3.37 (3.27 to 3.47)
With parents	3.59 (3.55 to 3.65)	3.38 (3.21 to 3.55)	3.06 (3.00 to 3.13)	3.57 (3.45 to 3.69)	3.37 (3.28 to 3.46)
With partner	3.58 (3.53 to 3.64)	3.23 (3.02 to 3.44)	3.09 (3.02 to 3.16)	3.76 (3.62 to 3.91)	3.45 (3.35 to 3.56)
With colleagues	5.57 (3.52 to 3.63)	3.06 (2.88 to 3.24)	3.09 (3.03 to 3.16)	3.70 (3.58 to 3.83)	3.40 (3.30 to 3.49)
Cook					
Yes	4.05 (3.90 to 4.19)	3.22 (3.13 to 3.31)	3.22 (3.04 to 3.41)	4.17 (3.96 to 4.38)	3.74 (3.50 to 3.97)
No	3.11 (2.95 to 3.28)	3.16 (3.06 to 3.26)	2.94 (2.74 to 3.15)	3.22 (3.00 to 3.44)	3.06 (2.81 to 3.31)
Place					
Home	3.61 (3.52 to 3.70)	3.35 (3.33 to 3.37)	3.08 (3.08 to 3.08)	3.76 (3.61 to 3.91)	3.40 (3.40 to 3.40)
Outside	3.55 (3.47 to 3.64)	3.03 (2.82 to 3.25)	3.08 (3.08 to 3.08)	3.63 (3.48 to 3.78)	3.40 (3.40 to 3.40)
Time					
< 1h	3.60 (3.48 to 3.73)	3.19 (3.19 to 3.19)	2.98 (2.78 to 3.19)	3.70 (3.70 to 3.70)	3.37 (3.23 to 3.52)
1h to 3h	3.61 (3.51 to 3.73)	3.19 (3.19 to 3.19)	3.02 (2.83 to 3.21)	3.70 (3.70 to 3.70)	3.35 (3.21 to 3.48)
≥ 3h	3.52 (3.40 to 3.64)	3.19 (3.19 to 3.19)	3.06 (2.90 to 3.23)	3.70 (3.70 to 3.70)	3.47 (3.35 to 3.60)

Notes: BCSQ = Brazilian Cooking Skills and Healthy Eating Questionnaire/ CI = confidence interval / - = no difference / SEC= Self-Efficacy in Cooking / SEFVS = Self-Efficacy in Using Fruits, Vegetables and Seasonings / SEPC (Produce Comsumption Self-Efficacy / CA = Cooking Attitude / CB = Cooking Behaviour
[a]$p < 0.05$