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Assessment of the culinary skills of freshmen at a public university

Avaliação das habilidades culinárias de estudantes ingressantes em uma universidade pública

Abstract

Introduction: Entering university represents a critical transition period for young adults. In the context of food and nutrition, this phase is often characterized by increased consumption of ultra-processed foods and a reduced intake of fresh foods. Consequently, a lack of culinary skills is recognized as a significant predictor for this consumption pattern among university students. ***Objective***: This study aims to evaluate the culinary skills of freshmen at a public university in Rio de Janeiro. ***Method***: This is an original cross-sectional descriptive study with a quantitative approach and involves freshmen of a public university who voluntarily completed the Brazilian Cooking Skills and Healthy Eating Questionnaire (BCSQ). Statistical analysis was conducted using multilevel linear regressions, and response variations were analyzed according to the dimensions of the BCSQ, categorized by age group, self-perceived cooking ability, and living arrangements (i.e., living with their parents without children). ***Results***: 205 students participated in the study, with high culinary skills, but most (59%) had low knowledge of culinary terms and techniques. Students who live with their parents exhibited greater culinary self-efficacy, self-efficacy in the consumption of fruits and vegetables, and cooking skills when compared to those who live without their parents. In addition, older students presented a higher culinary attitude. ***Conclusion***: The students had positive results in relation to culinary skills, but low knowledge of culinary terms and techniques, which may hinder the preparation of food. Living with parents and older ages were positively associated with scales involving culinary skills.

Keywords: Life skills. Students. Cooking. Universities.

Resumo

Introdução: O ingresso na universidade representa um período crítico de transição para adultos jovens. Na alimentação e nutrição, esse processo é descrito na literatura como uma fase com alto consumo de ultraprocessados e carente em alimentos *in natura*. Nesse contexto, a falta de habilidades culinárias é compreendida como um importante preditor para esse padrão de consumo em universitários. ***Objetivo***: Avaliar habilidades culinárias de estudantes ingressantes em uma universidade pública no Rio de Janeiro. ***Método***: Trata-se de estudo descritivo transversal original com abordagem quantitativa, conduzido com estudantes ingressantes em uma universidade pública, que responderam voluntariamente ao Questionário Brasileiro de Habilidades Culinárias e Alimentação Saudável (QBHC). A análise estatística foi realizada por regressões lineares multiníveis e as variações de respostas foram analisadas de acordo com as dimensões do QBHC agregadas por faixa etária, se considera que sabe cozinhar e se mora com os pais e sem filhos. ***Resultado***:

Participaram da pesquisa 205 estudantes, apresentaram alta habilidade culinária, porém a maioria (59%) tinha baixo conhecimento de termos e técnicas culinárias. Estudantes que moram com os pais apresentaram maior autoeficácia culinária, autoeficácia no consumo de frutas, legumes e verduras e habilidade culinária quando comparados àqueles que moram sem os pais. Ademais, estudantes mais velhos apresentaram maior atitude culinária. *Conclusão*: Os estudantes apresentaram resultados positivos em relação às habilidades culinárias, porém baixo conhecimento de termos e técnicas culinárias, o que talvez dificulte o preparo dos alimentos. Morar com os pais e idades mais avançadas se associaram positivamente a escalas que envolvem habilidades culinárias.

Palavras-chave: Habilidades para a vida. Estudantes. Culinária. Universidades

INTRODUCTION

Entering university represents a critical transition period for young adults and should be regarded as a complex and multidimensional process involving several factors of an inter- and intrapersonal nature.[1-3] Besides changes in development from the final phase of adolescence to the initial phase of adult life, students face challenges that involve both the demands of the new academic context and the consequences that this scenario entails. Accordingly, the initial experience of entering higher education is a crucial moment for students, since they start to attend a functioning structure that they do not master, given the great differences between university and high school.[4]

In the context of food and nutrition, this transition process has also been described in the literature as a critical phase, marked by eating patterns that are unfavorable to health.In a cross-sectional study involving students from a public university in Rio de Janeiro, several unfavorable eating practices were identified, including: skipping having breakfast, replacing dinner with snacks, low consumption of fruits, vegetables, and beans, and frequent intake of sugary drinks, sweets, and and packaged snacks.[5] A literature review[6] on the subject showed that university students display a high consumption of fast foods, snacks, fried foods and sweets, while having a low consumption of fruits and vegetables, a pattern that contributes to a worsening of nutritional status and is associated with the development of Noncommunicable diseases (NCDs), such as obesity. Several factors can contribute to the increase in the consumption of ultra-processed foods to the detriment of fresh or minimally processed foods by university students. These include easy access to foods of low nutritional quality, the absence of healthy options in university canteens, the scarcity of time due to academic demands, and the lack of culinary skills. The latter has been recognized as a important predictor of this pattern of food consumption.[7]

The Food Guide for the Brazilian Population[8] indicates some obstacles to healthy eating, including information, supply, cost, culinary skills, time, and advertising. Regarding culinary skills, the Guide states that "the weakening of the transmission of culinary skills between generations favors the consumption of ultra-processed foods", and that due to this weakening scenario, young people have less and less confidence and autonomy in food preparation.

There is a divergent in the conceptualization of culinary skills in the literature. A review of the concept of culinary skills carried out in Brazil[9,10] identified that, while some authors define culinary skills in a more traditional way, the term "culinary from scratch" is often used, which means cooking from freshand minimally processed foods.[9] Others expand the concept by including the use of technology, such as microwave ovens, considering that cooking foods that already have a pre-preparation (processed and ultra-processed) is also included in culinary skills.[11] Based on these comparisons and analyses, the authors of the review propose the following concept, which will be adopted in the present study.[10] Culinary skills are defined as "confidence, attitude, and application of individual knowledge to conduct culinary tasks ranging from menu planning and shopping to the preparation of fresh, minimally processed, processed or ultra-processed foods ".[10]

Given the importance of culinary skills in fostering healthy eating habits, nine studies were identified in a literature search that assessed these skills among university students (details of the search can be found in the supplementary material). These studies were conducted in multiple regions, including Brazil, North America, and Europe, with three studies in each of these areas. However, they presented controversial results. In one study, higher levels of culinary skills were associated with food insecurity;[12] in another, a higher level of culinary self-efficacy was associated with greater food safety.[13] Another investigation conducted in North America analyzed predictors for culinary skills in college students and found the habit of culinary as a teenager as the main one.[14] One of the studies conducted in Portugal, which investigated the same theme,

had the following results: female gender, older students (over 20 years of age) and not living with their parents.[15] Regarding the level of culinary skills in university students, a study carried out in Spain identified a lack of skills among students,[16] while another study, conducted in Portugal, found that most students reported feeling very confident in the culinary skills assessed.[17] A compilation of these studies can be accessed in the supplementary material.

Studies in Brazil reported that students with a higher level of culinary skills increased the probability of using fresh ingredients during the pandemic[18] and had daily consumption of vegetables.[19] Additionally, not living with parents and having more than one hour a day available to cook were factors positively associated with the level of culinary skills.[20] The primary barriers identified in Brazilian and North American studies regarding the development of culinary skills among university students were include inadequate access to transportation for reaching markets and grocery stores, insufficient financial resources, and a lack of time for cooking and shopping.[12,13,20]

Thus, given the transition scenario faced by students entering the university, which may be associated with a negative change in food consumption, and that the lack of culinary skills may influence this inadequate consumption, knowing the culinary skills of university students can help to conduct interventions to promote healthy eating for this group. Therefore, the present study aims to evaluate the culinary skills of students entering a public university in Rio de Janeiro.

METHODS

Study design and data collection

This is a cross-sectional descriptive study with a quantitative approach, conducted between July 2022 and February 2023, with incoming students from all undergraduate courses at a public university, from 2022.1 to 2022.2.The university's undergraduate courses are divided into four major areas: Biomedical, Social Sciences, Education and Humanities, and Technology and Sciences. The recruitment was carried out in conjunction with the study "Food conditions, nutrition, health and food and nutritional security of university students and relationship with the university food environment", which applied an online questionnaire with incoming students in 2022. This instrument was sent in Google Forms format to the e-mail of students from all undergraduate courses, who answered voluntarily. In addition, printed QRcodes were delivered in person at the university, which directed to the questionnaire, during first-period classes, in academic centers, in the university restaurant and at university events. An Instagram profile was also created to publicize the survey. The sociodemographic data collected in the study included: age, gender, undergraduate course, race/color, and living arrangements. Additionally, participants were asked the following question: “Do you consider that you know how to cook?” (yes/no). (See Supplementary Table 1 for details)At the end of the questionnaire, there was the following question: "Do you accept to participate in a research on culinary skills?". Those who answered "yes" were contacted via e-mail to participate in this research, responding a questionnaire on culinary skills, with the following inclusion criteria: starting an undergraduate course and answering the questionnaire in the period in which they started the course.

Culinary skills

The evaluation of the students' culinary skills was conducted through the application, in full, of the Brazilian Cooking Skills and Healthy Eating Questionnaire (BCSQ), which was adapted and validated for the Brazilian population.[21] During its validation, the questionnaire underwent in the number of reduction of

items, ultimately consisting of 36 items distributed across the seven scales of the original American version. A description of these scales is provided in Chart 1.

Chart 1. Description of the seven BCSQ scales.[21,35,36]

Dimensions/scales:	Description:
Part 1: Availability/Affordability of Fruits and Vegetables	
Availability / Accessibility of Fruits, Vegetables and Greens (AAFV)	Measures the availability of fruits and vegetables and greens in the last week
Part 2: Cooking Skills	
Culinary Attitude Scale (CA)	Measures how respondents feel about culinary (whether they like it, try new recipes, enjoy culinary, etc.)
Culinary Behavior Scale (CB)	Measures how often respondents prepare different types of food
Scale of Self-Efficacy in the Consumption of Fruits, Vegetables and Greens (AUCFLV)	Measures respondents' confidence in consuming the recommended daily amount of fruits and vegetables
Culinary Self-Efficacy Scale (CSE)	Measures respondents' confidence in performing culinary activities (e.g., using knives, following recipes, and preparing meals from what they have at home)
Self-Efficacy in the Use of Fruits, Vegetables andGreens (SEFVS)	Measures respondents' confidence in culinary using fruits, vegetables, greens
Part 3: Knowledge of Culinary Terms and Techniques	
Evaluation of Knowledge of Culinary Terms and Techniques (CTTC)	Evaluates knowledge of basic culinary terms and techniques (blanching, pre-preparation, sautéing, etc.)

The BCSQevaluation is divided into three parts, which are analyzed independently. The first corresponds to scale 1, which provides for the Availability/Accessibility of Fruits and Vegetables (AAFV), classifying the group as high, medium or low availability of these foods. The second part evaluates scales 2 to 6, which correspond to Culinary Attitude (CA), Culinary Behavior (CB), Self-Efficacy in the Consumption of Fruits and Vegetables (AUCFLV), Culinary Self-Efficacy (CSE) and Self-Efficacy in the Use of Fruits and Vegetables (AUFLV), respectively. The total scores from scales 2 to 6 provides a global assessment of culinary skills. For the classification of these first two parts, the average score of each question is calculated, which are added to provide an overall result of the population analyzed on each scale. Therefore, this analysis does not provide individual results.

Conversely, the third part, corresponding to scale 7 of the questionnaire, which assesses Knowledge of Culinary Terms and Techniques (CTTC), categorizes individuals with high or low knowledge, allowing the results to be presented in absolute and relative frequency.

Statistical analysis

The data were analyzed using multilevel linear regressions. Unlike traditional regressions (only one level), multilevel regression takes into account the data in its hierarchical structure (different levels of information), thus producing more reliable estimates adjusted to the reality of the data investigated.[22] This analysis considers intra- and intergroup variability. It is important to note that prior to conducting the statistical analysis, the database was thoroughly reviewed for accuracy and completeness.

All subjects with missing information, as well as those who represented an isolated group, were excluded from the database. This action prevents misinterpretations and does not overestimate the response values of a single subject.

Initially, the variations in the students' responses were analyzed according to the dimensions of the BCSQ, aggregated by age group (≤ 24 years and ≥ 25 years), if they know how to cook (yes and no), whether they live with their parents and without children (yes and no), gender (female and male) and area of study (Biomedical, Social Sciences, Education and Humanities and Technology and Sciences). Variable intercept models were employed, considering students (Level 1) nested by group (Level 2; e.g., age group). Based on this model, the low explanatory power/influence of gender and study area variables on the BCSQ dimensions was verified. The table with the estimates of the complete model, with all the sociodemographic variables analyzed, is available in the supplementary material (Supplementary Table 2). Therefore, these parameters were excluded and the final model was composed of the variables of age group, whether they know how to cook and whether they live with their parents and without children. Based on previous studies with the population of Brazilian university students and using the same data collection instrument, it had already been verified that the gender variable is not an explanatory variable for the present question.[23]

We executed the model estimates based on maximum likelihood and used the "lme4"[24] package to analyze the models in the R statistical software.[25] The model estimates were extracted considering a 95% confidence interval.

Ethical aspects

The study received approval by the Research Ethics Committee of the Pedro Ernesto University Hospital (HUPE/UERJ) (CAAE: 54239621.4.0000.5259). The Informed Consent Form (ICF) was provided at the beginning of the online questionnaire, and the students could only proceed with the study by clicking on "I accept to participate".

RESULTS

Sociodemographic characteristics of the sample

Among the 3,412 freshmen in 2022, 1,111 responded to the main study questionnaire, of which 660 agreed to answer the culinary skills questionnaire; however, only 234 students completed the BCSQ. Of the 234, 205 met the inclusion criteria for the survey and were included in the study.

Among the freshmen who participated in the survey (205), the respondents were categorized according to the area of their undergraduate courses, according to the provision of courses available on the university's website. Most were enrolled in Education and Humanities courses (36%), followed by Technology and Science (30%). Students were enrolled in similar proportions in the fields of Biomedicine (17%) and Social Sciences (16%). In terms of self-declaration of race/color, most students identified as white (53%) or brown

(30%).Among the 205 participants, 195 were entered into the statistical analysis, as detailed in the statistical analysis section. The participants were between 20 and 68 years of age (median 24), were mostly women (72%), aged 25 years or older (53%), lived with their parents and had no children (55%), and the majority (88%) stated that they knew how to cook (Table 1).

Table 1. Sociodemographic characteristics of the 195 students entering a public university in Rio de Janeiro in 2022 included in the statistical analysis. Rio de Janeiro, RJ, 2022.

Sociodemographic Parameters	N	%
Age (median):	24 (20 - 68)	-
≤ 24 years old	92	47
≥ 25 years old	103	53
Gender*:		
Cis woman	140	72
Cis man	55	28
Lives with parents and no children:		
Yes	108	55
No	87	45
Knows how to cook:		
Yes	171	88
No	24	12

Caption:
* To allow statistical analysis, subjects representing an isolated group were excluded; therefore, gender parameters from the original sample (such as trans man) were not accounted for.
Source: the authors

Description of Cooking Skills

Students entering the university reported an average level of "availability of fruits, vegetables and greens" in their households. In relation to scales 2 to 6, the freshmen presented intermediate "culinary attitude", high "culinary behavior", high "self-efficacy in the consumption of fruits, vegetables and greens", high "culinary self-efficacy" and high "self-efficacy in the use of fruits, vegetables and greens", which resulted in high culinary ability. Finally, most of incoming students were classified as having low "knowledge of culinary terms and techniques" (59%).

Statistical analysis according to sociodemographic variables

The results of the multilevel analyses (Table 2) revealed significant differences in the "Culinary Attitude" dimension, in which a substantial discrepancy was observed between younger and older students. Younger students exhibited lower estimates compared to older students. Therefore, we can observe that the older students had a greater culinary attitude, that is, they feel more attracted to this practice, they like to cook, test new recipes and feel pleasure in doing so.

The same was observed for the dimension "Self-efficacy in the Consumption of Fruits, Vegetables and Greens". However, in this dimension, there were no substantial differences between the age groups, but a possible tendency for older students to exhibit higher values than younger students. That is, older students feel more confident in consuming, daily, the recommended amount of this food group.

In the dimensions "Culinary Self-Efficacy" and "Self-Efficacy in the Use of Fruits, Vegetables and Greens", as well as in the total value of the questionnaire, there was a substantial difference only between students who lived and did not live with their parents. In this case, students who lived with their parents reported higher availability of fruits, vegetables, and greens compared to those who did not live with their parents. Therefore, students who reside with their parents exhibited greater culinary self-efficacy compared to those who do not, which means that they have more confidence when performing culinary activities, such as using knives, following recipes, and preparing meals with the food available at home. Additionally, students who live with their parents also to have greater self-efficacy in using fruits, vegetables, and greens, meaning they feel more confident in preparing this food group. No substantial discrepancies were observed in the groups, considering the dimensions "Culinary Behavior", "Availability of Fruits, Vegetables and Greens" and "Knowledge of Culinary Terms and Techniques". Furthermore, there was no significant differences in any of the dimensions of the BCSQ between the students who stated that they knew and those who did not know how to cook.

Table 2.Estimates and 95% confidence intervals (CIs) of the dimensions of the Brazilian Culinary Skills Questionnaire (BCSQ) were calculated and aggregated by the characteristics of "living with their parents", "knowing how to cook" and "age group". Rio de Janeiro, RJ, 2022.

	CA[a]	CB[b]	AUCFLV[c]	CSE[d]	SEFVS[e]	TOTAL	DFLV[f]	CTTC[g]
	Estimativa e intervalos de confiança (95%)							
Lives with parents								
No	14.80 (14.45 to 15.16)	10,90*	9.72 (9.16 to 10.28)	24.09 (23.24 to 24.93)	15.07 (14.40 to 15.74)	74.12 (71.30 to 76.95)	5.90 (5.66 to 6.14)	10.87*
Yes	14.94 (14.59 to 15.29)	10,90*	10.06 (9.52 to 10.61)	24.99 (24.20 to 25.77)	16.07 (15.46 to 16.68)	77.03 (74.33 to 79.73)	6.02 (5.78 to 6.27)	10.87*
Knows how to cook								
Não	14.84 (14.55 to 15.13)	10,90*	10.10 (9.37 to 10.83)	24.54*	15.59 (15.34 to 15.85)	75.58*	5.96*	10.87*
Sim	14.91 (14.62 to 15.19)	10,90*	9.68 (9.07 to 10.30)	24.54*	15.55 (15.29 to 15.80)	75.58*	5.96*	10.87*
Age group								
≤ 24 years old	14.37 (13.72 to 15.02)	10.81 (10.49 to 11.14)	9.57 (8.86 to 10.28)	24.54*	15.57*	74.49 (71.85 to 77.13)	5.96*	10.86 (10.76 to 10.95)
≥ 25 years old	15.37 (14.75 to 15.99)	10.98 (10.66 to 11.30)	10.21 (9.52 to 10.90)	24.54*	15.57*	76.66 (74.08 to 79.25)	5.96*	10.88 (10.78 to 10.97)

Legend:
* Very small variability, such that with only two decimalplaces, the confidence interval is equal to the estimate
[a]Culinary Attitude (CA)
[b] Culinary Behavior (CB)
[c] Self-Efficacy in the Consumption of Fruits, Vegetables and Greens (AUCFLV)
[d]Culinary Self-Efficacy (CSE)
[e]Self-Efficacy in the Use of Fruits, Vegetables and Greens (SEFVS)
Source: the authors.

DISCUSSION

The study aimed to identify the culinary skills of university students by administering the BCSQ to fresh men entering a public university in Rio de Janeiro in the periods of 2022.1 and 2022.2 semesters. Overall, the students reported average availability of fruits, vegetables and greens, high culinary ability and low knowledge of culinary terms and techniques. Students living with their parents exhibited greater culinary self-efficacy, higher self-efficacy in the consumption of fruits, vegetables and greens, and superior culinary skills compared to those livingindependently. Additionally, older students demonstrated a more positiveculinary attitude.

Regarding the sociodemographic characterization, the data found in this study are like those seen in the literature review. The sample was composed mostly of women, with a median age of 24 years, similar to other studies that evaluated culinary skills in university students in North America,[12-14] in Europe[15-17] and in Brazil,[18-20] in which the participants had a mean age between 20 and 25 years, most of whom were women. Most of the students were enrolled in undergraduate courses in Education and Humanities, which also occurred in a Spanish study[16] and in two Brazilian studies[18,20] who analyzed the same theme, and in Technology and Sciences, unlike some other North American[14] and European samples,[15] in which most of the students were from the biomedical area. In addition, most participants reported knowing how to cook, of the nine studies analyzed in the literature review, four included this question and in all of them the answer was positive.[12,18-20]In addition, most students lived with their parents, as in other European[15] and Brazilian[18,20] studies on culinary skills in university students.

The results of the freshman students who answered the BCSQ were in general positive, with average availability of fruits, vegetables and greens, in addition to having a high classification on all scales from 2 to 6 (Culinary Attitude, Culinary Behavior, Self-Efficacy in the Consumption of Fruits, Vegetables and Greens, Culinary Self-Efficacy and Self-Efficacy in the Use of Fruits, Vegetables and Greens), with the exception of Culinary Attitude, which was intermediate, resulting in a high level of culinary skill. However, despite the promising results from the first and second parts of the questionnaire, most students demonstrated low Knowledge of Culinary Terms and Techniques in the third part.

This result was like that found in a study conducted in universities in the south of the country[18] that used the same questionnaire. This score shows that, possibly, despite having an average availability of food and a high level of culinary skills, the practices may be conducted with little technique and low knowledge of the terms that involve culinary, being, for example, more difficult to precisely follow the instructions of a recipe.[27]

Several studies conducted in different countries have presented that interventions that seek to improve the knowledge of culinary techniques can be important to the increase of culinary skills and, consequently, healthier eating habits. In a study conducted in the United States,[28]among university students evaluated through focus groups, students reported that they would eat healthier if they had access to knowledge and information to prepare healthy foods. In addition, a study conducted in Canada,[14] which analyzed the culinary skills of students at a university in Ontario, found that students with higher levels of culinary skills took aFood and Nutrition course. A longitudinal study conducted in the United States involving 1,158 young adults aged 18 to 23 years concluded that individuals who ratedtheir culinary skills as very adequate in the first survey exhibited better nutrition-related outcomes in a follow-upsurvey conducted 10 years later. These outcomes included a regular consumption of vegetables and a lower intake of fast-food. [29]

Data from Brazil agree with these findings. One randomized study evaluated the impact of an intervention program on participants' culinary skills. The intervention included five culinary workshops and a shopping selection workshop at the popular food market and the students answered the BCSQ in three

moments. The intervention was seen to increase confidence in consuming and using fruits, vegetables and greens, culinary attitude, culinary confidence, culinary knowledge and the availability and access to fruits, vegetables and greens at home.[30]

Another study found that higher levels of culinary skills were linkedto increased daily consumption of vegetables amongstudents from eight private and two public universities in Brazil.[19] Additionally, university students with the highest culinary skills were more likely to use fresh ingredients during the pandemic.[18]

In agreement with the studies, the Food Guide for the Brazilian Population[8] indicates that culinary skills are essential to meet its guidelines, since they are required to select, pre-prepare, season, cook and combine fresh and minimally processed foods. Thus, the positive results regarding culinary skills found in this study may facilitate the consumption of fresh and minimally processed foods among university students.

The results also demonstrated that students who lived with their parents had greater culinary self-efficacy, greater self-efficacy in the consumption of fruits, vegetables and greens and higher levels of culinary ability when compared to those who lived without their parents. This result are different from published studies, in which not living with one's parents was positively associated with culinary skills.[15,20]Conversely, parents' culinary skills play an essential role in influencing their children's healthy food choices.[31,32] A study conducted in Brazil demonstrated that a higher degree of parents' culinary skills was significantly associated with a higher consumption of greens and/or cooked vegetables and raw salads[33]. These findings may explain the greater self-efficacy in the consumption of fruits and vegetables among students who lived with their parents, given their influence on their diet. Regarding age, older students exhibited greater culinary ability, in agreement with the results found in the literature.[15,20]

Culinary skills are shown to be an important factor for healthy eating. However, it is important to highlight that they are not the only factor that impacts a positive outcome in nutrition, since nutritional status is influenced by "biological, environmental, economic, social (health and education), cultural and ideological factors, and with the way family and individual production and consumption are organized".[34] In exploring the various factors that influence food and nutrition, the literature highlights key barriers to developingculinary skills,including inadequate access to transportation for reaching markets and grocery stores, financial constraints, and a lack of time for cooking and shopping.These challenges are closely tied to broader economic and social contexts.[12-14,20]

The instrument used in the data collection of the present study (BCSQ) does not assess the barriers mentioned above, and it is not possible to relate them to culinary skills. However, the average availability of fruits, vegetables and greens can significantly impact culinary practices and, consequently, healthy eating habits.[12] In addition, the concept of culinary skills used as a basis in this study[10] establishes two categories, one related to food - which involves the preparation of fresh/minimally processed and/or processed/ultra-processed foods - and the other to the individual - which includes confidence, attitude, behavior and knowledge used in the preparation of food. In the present study, an intermediate culinary attitude stands out, which is evaluated in many studies as positive or negative and is associated with how the individual feels when culinary - whether he has pleasure, whether he tests new recipes, etc., in addition to low knowledge of culinary terms and techniques. The three classifications discussed can significantly impact the frequency with whichculinary skillsare utilized.[10,12,27]

Limitations and strengths

One strength of the present study is the use of a validated questionnaire adapted to the Brazilian population. In addition, based on the outcomes of the BCSQ, it was possible to identify, in the population studied, a difficulty in the knowledge of terms and techniques and in the culinary attitude, and it was possible to propose interventions that seek to strengthen these points. Conversely, limitations inherent to quantitative research, which does not consider values, subjectivities and socioeconomic aspects, make it difficult to understand this difficulty in depth. Given that culinary terms and techniques such as blanching and sautéing are used primarily in technical and academic environments, their low knowledge may not interfere in food preparation, and it is not possible to measure this relationship through the questionnaire applied.

The favorable results regarding culinary skills may be influenced by selection bias, as participants who chose to engage with the BCSQ likely had a preexisting interest in cooking, which could correlate with higher culinary abilities.Future studies can follow the same students throughout the undergraduate course, to verify if there have been changes in the scales over time. In addition, it may be important to assess the relationship between culinary skills and food safety, as some studies mentioned in this research have done.[12,13] Other aspects of the population can also be explored in future studies, to investigate possible differences in culinary skills.

CONCLUSION

Freshmen generally exhibited high culinary ability but low knowledge of culinary terms and techniques. While understanding these terms can facilitate the understanding of recipes and the preparation of food, conversely, since they are more commonly used in academic environments and unusual in-home environmentsthat they may not be critical for effective culinary practice. Likewise, the average availability of fruits and vegetables, together with an intermediate culinary attitude, can have a negative impact on culinary practice. Additionally, living with parents and being older were positively associated with culinary skills. Thus, interventions such as culinary workshops, which aim to strengthen these skills, can be positive for this group of students..

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SUPLEMENTARY MATERIAL

Below, we outline the search conducted to identify studies on culinary skills in university students. A search was conducted in the Scopus, ProQuest, and SciELO databases from October to November 2022. In Scopus and ProQuest, the following terms were used: "food skill", "cook* skill*", "food preparation", "home cook*", "cook* self-efficacy", "culinary skills", "student*", "young adult*", "freshman", "sophomore" and "university*". In SciELO, the search was conducted in Portuguese and was broader, using only the terms "culinary skill*" and "culinary". No filter was used in any of the searches. The inclusion for the studies were: to evaluate culinary skills and research conducted with university students.Conversely, the exclusion criteria included: intervention studies, qualitative studies, validation studies, systematic review, book chapter and studies with students from residency programs. Ultimately, nine studies were identified that evaluated such abilities in university students (supplementary table).

Supplementary table. Result of the systematic search on culinary skills in university students.

Study/Country (university)	Participants (n) and average age (years):	Gender N (%):	Lives with parents N (%):	Instrument to assess Culinary Skills (CS) / validation	Main results
Meal preparation and consumption before and during the COVID-19 pandemic: The relationship with culinary skills of Brazilian university students/ Brazil (UFRGS and UFSC)	1919 /23,9	Female - 1,410 (73.5%) Male - 509 (26.4%)	Yes - 939 (48.9%)	Brazilian Culinary and Healthy Eating Skills Questionnaire (BCSQ)/ Validated	Most students had a high level of CH. Students with a higher level of CS increased the likelihood of using fresh ingredients in the pandemic.
Association of personal characteristics and culinary skills with vegetable consumption frequency among university students / Brazil (8 private and 2 public)	525 / 24	Female - 392 (74.67%) Male-133 (25.33%)	Yes - 318 (60.57%)	Brazilian Culinary and Healthy Eating Skills Questionnaire (BCSQ)/ Validated	Higher levels of culinary skills were associated with a higher daily consumption of vegetables.
Self-efficacy in culinary and consuming fruits and vegetables among Brazilian university students: the relationship with sociodemographic characteristics / Brazil (UFSC)	766 / 21	Female - 457 (60%) Male - 309 (40%)	Yes -341 (45%)	Brazilian Culinary and Healthy Eating Skills Questionnaire (BCSQ)/ Validated	Factors associated with a higher level of culinary skills are: not living with parents and having more time available to cook.
Characteristicsassociatedwithculinaryfrequencyamongcollegestudents / United States (University of North Carolina at Chapel Hill)	4845 / 23	Female -3,487 (72%) Male -1,321 (27.3%)	-	CS measures with the question, "how would you evaluate your CS?" A: excellent, good, intermediate, or low" / Validated food safety questionnaire	Cooking frequency was associated with higher levels of CS and results of "often" and "sometimes" culinary were higher in students with lower levels of food security

Supplementary table. Result of the systematic search on culinary skills in university students.

Study/Country (university)	Participants (n) and average age (years):	Gender N (%):	Lives with parents N (%):	Instrument to assess Culinary Skills (CS) / validation	Main results
Very Low Food Security Status is Related to Lower Cooking Self-Efficacy and Less Frequent Food Preparation Behaviors Among College Students / United States (University of Alabama)	368 / 20,5	Female -259 (70.7%) Male -109 (29.6%)	-	The Cooking Self-Efficacy Questionnaire. Food Preparation and Purchasing Behaviors Questionnaire / Validated	Students in exceptionally low food security situations had significantly lower culinary self-efficacy and culinary preparation scores than those in food security.
Predictors of food skills in university students / Canada (University of Western Ontario)	3354 / 20,7	Female -2,475 (73.8%)	-	Total food skill score[a]/ Validation not informed	The biggest predictor for culinary skills was having a habit of culinary as a teenager.
Cooking skills and socio-demographicsamongPortugues euniversitystudents / Portugal (universities of Portugal)	730 / 22,8	Female - 588(80.5%) Male - 142 (19.5%)	Yes- 379 (51.9%)	Cooking Skills Scale (CSS) / Validated	CS was higher in women, older students, and those who did not live with their parents.
Habits, preferences, and culinary skills of first-year students at the university of Huelva / Espanha (University of Huelva)	756 / 20,95	Female - 472 (62.4%) Male - 281 (37.1%)	Yes- 358 (47.35%)	HOC questionnaire / Validated	Low level of CS among the university students participating in the studies.
Cooking Skills and Consumption of Ready Meal in University Students of Barcelona, Spain / Spain (Ramon Llull University)	525 / 21	Female - 427 (81.3%)	-	Validated in Canada [b]	Students reported feeling very confident in their CS.

[a] [a]It is not clear in the article which questionnaire was applied, but through a search in the references, the *Total food skill score* was found. An e-mail was sent to the authors requesting the complete questionnaire that was used in the research, but no response was obtained.
[b]The article does not inform the questionnaire used. No e-mail address was found to contact the authors.

Supplementary table 1. Sociodemographic characterization questions of the sample

Sociodemographic characterization questions:	Answer Options:
Date of birth	Open-ended question
Gender	Cis woman Trans woman Transvestite Woman/Transvestite Cis man Trans man Non-binary person Other I prefer not to inform
What is your race/color?	White Black Yellow Brown Indigenous
What is your undergraduate course?	Open-ended question
Do you think you know how to cook?	Yes No
Who do you live with? (You can check more than one option)	Alone Spouse or partner Child or stepchild(ren) Mother Father Siblings Other relatives Friends Republic Other I prefer not to answer

Supplementary table 2. Estimates and 95%confidence intervals (CIs) of the dimensions of the Brazilian Culinary Skills Questionnaire (BCSQ)were calculated andaggregated by the characteristics of "living with parents and without children", "knowing how to cook", age group, gender and area of study.

	CA	CB	AUCFLV	CSE	SEFVS	TOTAL
	Estimation and confidence intervals (95%)					
Lives with parents						
No	14.85 (14.58 to 15.11)	10.90*	9.73 (9.18 to 10.28)	24.10 (23.23 to 24.97)	15.02 (14.16 to 15.88)	74.10 (71.25 to 76.96)
Yes	14.92 (14.66 to 15.19)	10.90*	10.06 (9.52 to 10.59)	24.96 (24.14 to 25.78)	16.03 (15.21 to 16.85)	76.91 (74.17 to 79.66)
Knows how to cook						
No	14.83 (14.48 to 15.19)	10.90*	10.10 (9.38 to 10.83)	24.53*	15.64 (15.08 to 15.16)	75.51*
Yes	14.94 (14.59 to 15.28)	10.90*	9.69 (9.07 to 10.30)	24.53*	15.42 (14.90 to 15.94)	75.51*
Age group						
≤ 24 years old	14.38 (13.73 to 15.02)	10.81 (10.47 to 11.15)	9.57 (8.87 to 10.28)	24.53*	15.53*	74.49 (71.85 to 77.13)
≥ 25 years old	15.39 (14.77 to 16.01)	10.99 (10.66 to 11.33)	10.21 (9.52 to 10.90)	24.53*	15.53*	76.66 (74.08 to 79.25)
Biomedical	14.89*	10.90*	9.89*	24.39 (23.69 to 25.10)	15.02 (14.07 to 15.97)	74.81 (72.67 to 76.94)
Social sciences	14.89*	10.90*	9.89*	24.43 (23.73 to 25.13)	15.22 (14.27 to 16.17)	75.22 (73.09 to 77.35)
Education and Humanities	14.89*	10.90*	9.89*	24.49 (23.83 to 25.16)	15.59 (14.75 to 16.43)	75.53 (73.54 to 77.53)
Technology and Science	14.89*	10.90*	9.89*	24.80 (24.13 to 25.48)	16.27 (15.41 to 17.13)	76.46 (74.44 to 78.49)
Gender						
Female	14.89*	10.90*	9.89*	24.53*	15.53*	75.51*
Male	14.89*	10.90*	9.89*	24.53*	15.53*	75.51*

Legend:
* Very small variability that, with only two places after the decimal point the confidence interval, is equal to the estimate.

Supplementary table 1. Continuation.

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	AAFV	CTTC
	Estimation and confidence intervals (95%)	
Lives with parents		
No	5.96*	10.89*
Yes	5.96*	10.89*
Knows how to cook		
No	5.96*	10.89*
Yes	5.96*	10.89*
Age group		
≤ 24 years old	5.96 (5.84 to 6.10)	10.89*
≥ 25 years old	6.02 (5.90 to 6.14)	10.89*
Field of study		
Biomedical	5.96*	10.89 (10.76 to 11.03)
Social sciences	5.96*	10.99 (10.86 to 11.13)
Education and Humanities	5.96*	10.83 (10.70 to 10.96)
Technology and Science	5.96*	10.84 (10.72 to 10.94)
Gender		
Female	5.96*	10.95 (10.82 to 11.08)
Male	5.96*	10.83 (10.73 to 10.95)

Legend:
* Very small variability that, with only two places after the decimal point, the confidence interval is equal to the estimate.

Contributors

Canella DS, Ribeiro ME, Perez PMP, Mazzonetto AC, participated in the conception and design of the study design; Tangerino GC, Ribeiro ME, participated in data collection; Tangerino GC, Quinaud RT, Canella DS, Mazzonetto AC participated in the analysis and interpretation of the data; Tangerino GC, Quinaud RT, Mazzonetto AC participated in the initial writing of the manuscript; Tangerino GC, Quinaud RTQ, Canella DS, Ribeiro ME, Perez PMP, Mazzonetto AC participated in the review and approval of the final version of the manuscript.

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