

# Self-efficacy in cooking and consuming fruits and vegetables among Brazilian university students: the relationship with sociodemographic characteristics

Self-efficacy  
in cooking

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Received 14 April 2020  
Revised 21 August 2020  
20 November 2020  
Accepted 23 December 2020

## Abstract

**Purpose** – Self-efficacy in cooking and consuming fruits and vegetables is one of the dimensions that compose cooking skills. This cross-sectional study aimed to assess the self-efficacy of Brazilian university students in cooking and consuming fruits and vegetables and examine the relationship of self-efficacy with sociodemographic and lifestyle characteristics.

**Design/methodology/approach** – Data were collected through an online questionnaire, which was culturally adapted and validated for the studied population. Questions about self-efficacy for using basic cooking techniques (SECT), self-efficacy for using fruits, vegetables, and seasonings (SEFVS) and produce consumption self-efficacy (SEPC) were rated on a five-point Likert scale. Differences in median self-efficacy score between groups were compared using the Mann–Whitney *U* test or the Kruskal–Wallis test followed by the Mann–Whitney *U* test.

This study was funded by the Brazilian Federal Agency for Support and Evaluation of Graduate Education (CAPES, Brazilian Ministry of Education) and the Human Resources Development Program (PRODEP) of the Federal University of Alagoas (UFAL). GLB and MMJ received a doctoral scholarship from CAPES, and RPCP is supported by a Research Productivity Scholarship from the Brazilian National Council for Scientific and Technological Development (CNPq). The funders had no role in the study design, data collection, analysis or interpretation. We thank all students of the Federal University of Santa Catarina (UFSC) who took part in this study and the undergraduate program staff who kindly forwarded the questionnaire to the students.



**Findings** – 766 subjects participated in the study. The mean age was  $21 \pm 5.6$  years, most respondents were female (60%), reported to know how to cook (72%), and lived with parents and/or grandparents (45%). The median SECT and SEFVS scores were 3.55, and the median SEPC score was 3.33. Female students, individuals aged more than 25 years, and students who did not live with their parents or grandparents had higher ( $p < 0.005$ ) self-efficacy scores. Low SECT, SEFVS and SEPC scores were associated with having less than one hour a day to cook ( $p = 0.023, 0.01,$  and  $0.002$ , respectively) and not knowing how to cook ( $p < 0.001$ ). There was no relationship of median self-efficacy scores with source of knowledge about cooking skills or parental education.

**Originality/value** – The results of this study can guide interventions and public policies aimed at health promotion in the university setting.

**Keywords** Cooking skills, Cooking self-efficacy, Food preparation, Fruits and vegetables, University student

**Paper type** Research paper

## Introduction

Young adults, the age group of most first-year university students, experience the transition from adolescence to adulthood (Arnett, 2007; Nanney *et al.*, 2015; Vadeboncoeur *et al.*, 2015). This period is marked by important changes, such as leaving home, developing decision-making autonomy (Nelson *et al.*, 2008) and having responsibility for food purchasing and preparation, all of which can lead to changes in eating habits (Ansari *et al.*, 2012).

In a literature review, Bernardo *et al.* (2017) identified that university students have a high intake of fast foods, snacks, fried food and sweets but a low intake of fruits and vegetables. Low vegetable consumption, which is contrary to the recommendations of the World Health Organization, was observed among university students in a review by Rodrigues *et al.* (2019). Specifically in Brazil, authors describe that the food environment of a Brazilian public university did not favor healthy food choices. Many factors can negatively influence dietary practices, including the low availability of fresh or minimally processed foods and culinary preparations based on these foods and the predominance of ultra-processed food (Franco *et al.*, 2020).

University students report some barriers to following healthy food habits, such as lack of time due to studies, high prices of healthy food, easy access to junk food and lack of knowledge about cooking skills (Wolfson *et al.*, 2016; Hilger *et al.*, 2017; Molenaar *et al.*, 2020). On the other hand, studies have shown that people who frequently prepare meals at home eat more fruits, vegetables (McLaughlin *et al.*, 2003; Larson *et al.*, 2006; Mills *et al.*, 2017; Hanson *et al.*, 2019; Haggmann *et al.*, 2020) and whole grains (Larson *et al.*, 2006) and have a lower consumption of fast foods (Van Der Horst *et al.*, 2011; Laska *et al.*, 2012; Hanson *et al.*, 2019; Lam and Adams, 2017), sugars and fats (Wolfson and Bleich, 2015).

Cooking skills can be defined as the confidence, attitude and application of individual knowledge to perform cooking tasks that range from planning menus and shopping to food preparation (Jomori *et al.*, 2018). Cooking skills are associated with the person's attitudes, knowledge, behavior and confidence regarding meal preparation (Byrd-Bred-Brenner, 2005; Clifford *et al.*, 2009; Wilson *et al.*, 2017; Kowalkowska *et al.*, 2018). One of the dimensions that assess cooking skills is cooking self-efficacy or confidence (Jomori *et al.*, 2018) that reflects the individual's confidence to use cooking techniques (Bandura, 1977). According to instrument for assessing cooking skills developed in the United States of America (Michaud, 2007; Condrasky *et al.*, 2011; Warmin *et al.*, 2012; Kerrison *et al.*, 2017) and translated and adapted to the Brazilian population (Jomori *et al.*, 2017), cooking self-efficacy were developed to evaluate cooking and nutrition, assessing confidence in complying with recommendations for the consumption of fruits and vegetables, confidence in cooking techniques and using fruits and vegetables when cooking.

This personal resource can influence the formation of long-lasting healthy eating habits (Nanney *et al.*, 2015). University students often lack the time, cooking skills and confidence to prepare their own meals, which is why they eat more meals out of home than other social groups (Escoto *et al.*, 2012; Pendergast *et al.*, 2016; Wilson *et al.*, 2017; Marquis *et al.*, 2018).

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A lack or loss of cooking skills may be due to limited confidence in performing basic cooking tasks. Researchers claim that such a lack of cooking self-efficacy or confidence can be mainly influenced by cultural gender roles (Daniels *et al.*, 2012), age (Ternier, 2010), sex (Lang and Caraher, 2001; Wilson *et al.*, 2017; Marquis *et al.*, 2018), social environment (Kabir *et al.*, 2018), cooking attitude (Ternier, 2010), level of education (Matthews *et al.*, 2016), access to home kitchen equipment (Wilson *et al.*, 2017; Kabir *et al.*, 2018), living arrangement (Wilson *et al.*, 2017), time available to cook (Lang and Caraher, 2001) and the transfer of cooking knowledge between parents and their children (Caraher *et al.*, 1999).

When entering a university, some individuals must face the beginning of an independent life and the challenge of making their own food choices (Sprake *et al.*, 2018; Stok *et al.*, 2018). As previously presented, studies have demonstrated that, when entering the university some students present with inadequate food habits (Bernardo *et al.*, 2017). This group of individuals are at an important life stage for the consolidation of possibly long-lasting health habits (Stok *et al.*, 2018). Thus, university students may develop unfavorable eating habits that can last a lifetime (Beaudry *et al.*, 2019).

As previously mentioned, some sociodemographic and lifestyle characteristics influence self-efficacy in cooking such as age, sex, undergraduate course, living arrangement, cooking skills, transfer of cooking knowledge and home meal preparation. However, it is essential to understand what are the specific characteristics that affect the study group to be able to target future interventions. Since, the university environment is considerate as a strategic environment for the promotion of healthy eating.

Researchers from many countries have investigated the cooking skills of young adults (Byrd-Bredbenner, 2005; Courtney *et al.*, 2016; Garcia *et al.*, 2016; Kourajian *et al.*, 2017; Wilson *et al.*, 2017; Kowalkowska *et al.*, 2018; Seabrook *et al.*, 2019). However, there are few studies that have researched cooking skills with a focus on cooking self-efficacy, especially among university students. In the present study for the first time, we investigate the relationship of self-efficacy in cooking and fruit and vegetable consumption with sociodemographic and lifestyle characteristics of first-year university students in Brazil.

## Methods

### *Study design*

This cross-sectional study examined self-efficacy in cooking and healthy eating behaviors among fresh students of a Brazilian public university. The data were collected in a previous investigation for transcultural adaptation and validation of the Brazilian questionnaire for the assessment of cooking skills and healthy eating behaviors (Jomori *et al.*, 2017).

### *Sample characteristics*

The study population consisted of fresh undergraduate students enrolled in a public university in Southern Brazil in 2015 ( $n = 4,112$ ). The representative sample was calculated by considering a prevalence of 5 multiple outcomes of 50%, an error of 5%, a design effect of 2, and a loss of 10%, totaling 766 participants. Inclusion criteria were age 16 years or older and first-year of undergraduate study at the Federal University of Santa Catarina (UFSC), Florianópolis, Brazil. Students enrolled in graduate programs or online undergraduate courses were excluded from the study.

Invitation fliers with a quick response (QR) code encoding the online survey website were distributed at a fresher welcome event, in classes, and at the entrance of the university restaurant. A link to the questionnaire was also posted on local websites. The online survey was made available from August to November 2015, when the desired sample size was reached.

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### *Data collection*

Data were collected using the Brazilian questionnaire for the assessment of cooking skills and healthy eating behaviors, adapted and validated for the Brazilian population (Jomori *et al.*, 2017) to be used in the Nutrition and Culinary in the Kitchen (NCK) program (Bernardo *et al.*, 2018). The original instrument was developed and validated in the United States as part of the Cooking with a Chef (CWC) program, a cooking and nutrition intervention for university students (Michaud, 2007; Condrasky *et al.*, 2011; Warmin *et al.*, 2012).

The Brazilian questionnaire for the assessment of cooking skills and healthy eating behaviors is divided into 8 scales, containing a total of 64 items. Each scale measures a cooking skills dimension: 1, availability and accessibility of fruits and legumes at home; 2, cooking attitude; 3, cooking behavior at home; 4, cooking behavior away from home; 5, produce consumption self-efficacy (SEPC); 6, self-efficacy for using basic cooking techniques (SECT); 7, self-efficacy for using fruits, vegetables and seasonings (SEFVS); and 8, knowledge of cooking terms and techniques.

In this study, we used data from the three dimensions related to self-efficacy. SECT measures confidence in using basic cooking techniques and is composed of 18 items. SEFVS refers to confidence in using fruits and vegetables in meal preparation and is composed of nine items. SEPC, which is composed of three items, assesses the confidence to follow recommendations on the consumption of fruits and vegetables (eat fruits and vegetables at every meal, every day; eat fruits or vegetables as a snack, even if everybody else were eating other snacks; eat the recommended three portions of fruits and vegetables each day) (Jomori *et al.*, 2017). Self-efficacy questions were rated on a five-point Likert scale ranging from 1 (extremely unconfident) to 5 (extremely confident) (Likert, 1932).

### *Sociodemographic and lifestyle data*

Participants were categorized by sex, age, field of study, class schedule, parental education and living arrangement. Lifestyle information included questions regarding their perceived ability to cook, amount of time available for cooking, source of cooking knowledge, whether the main meal is usually eaten at home or away from home and the most common place to eat out. According to previously presented, these variables can be explored since they presented differences in cooking self-efficacy across many studies (Jomori *et al.*, 2017).

### *Statistical analysis*

Survey results were exported to a Microsoft Office Excel® spreadsheet and transferred to Stata version 11.0 (Stata Corp. College Station, Texas, USA) for analysis.

Sociodemographic and lifestyle data were analyzed by descriptive statistics. Categorical variables are presented as absolute and relative frequencies and age as mean and SD. Self-efficacy scores are presented as median and interquartile range. Because the Shapiro–Wilk test revealed that sociodemographic and lifestyle data were not normally distributed, differences in median scale scores between groups were compared using the Mann–Whitney *U* test or the Kruskal–Wallis test followed by the Mann–Whitney *U* test. The level of significance was set at  $p < 0.05$ .

### *Ethical considerations*

The study was approved by the Human Research Ethics Committee of the Federal University of Santa Catarina (protocol no. 1.318.443) and was conducted in accordance with the Helsinki Declaration (World Medical Association, 2000).

## **Results**

The sample consisted of 766 first-year university students, with a mean age of  $21 \pm 5.6$  years. Most participants were female (60%), enrolled in the field of Humanities and Social Sciences

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(39%), studying full-time (53%) and living with their parents or grandparents (45%). About 72% of respondents reported knowing how to cook and 70% reported having from 1 to 3 h available for cooking daily. About half of the respondents (51%) had their main meal (lunch or dinner) away from home on most days (Table 1).

#### *Descriptive analysis of self-efficacy scores*

Self-efficacy results are presented in Table 2. The median SECT score was 3.55. Most students reported being confident or extremely confident in using half of the cooking techniques listed on the SECT scale. Microwaving obtained the highest percentage (55%) of “extremely confident” responses. Boiling water and simmering also obtained high scores, with respectively 81 and 80% of participants reporting to be confident or extremely confident in using the techniques. On the other hand, most respondents felt unconfident or extremely unconfident in poaching (54%) and sautéing (43%) (Table 2).

The median SEFVS score was 3.55, equal to the median SECT score. Most students reported being confident or extremely confident in six of the nine analyzed items, especially in using fruits (79%), roots and tubers (69%) and herbs (69%). Use of hot sauces received the lowest scores, with 44% of respondents reporting to feel unconfident or extremely unconfident.

SEPC had a median score of 3.33. Most students (61%) felt confident or extremely confident in eating fruits and vegetables every day. Their confidence in eating fruits and vegetables as snacks if other people were eating different snacks was 49%. About 46% of participants felt unconfident or extremely unconfident in following the recommendation to eat three portions of fruits and three portions of vegetables every day (Brazil, 2008).

#### *Relationship between self-efficacy results and sociodemographic and lifestyle characteristics*

There was a significant association ( $p < 0.05$ ) of SECT, SEFVS and SEPC scores with sex, age, cooking ability and time available for cooking (Table 3). Self-efficacy scores differed significantly between fields of study; life science students had the highest median self-efficacy scores, whereas exact science students had the lowest ( $p < 0.05$ ). SECT and SEPC scores differed between living arrangements. SECT and SEFVS scores were influenced by out-of-home eating.

SECT, SEFVS and SEPC scores showed no relationship with parental education level or source of cooking knowledge.

## **Discussion**

Higher self-efficacy in cooking and fruit and vegetable consumption was observed among students who were female, aged over 25 years, enrolled in life science courses, living alone or with friends, reported to know how to cook, ate the main meal at home and spent more than 1 h per day cooking.

Studies have shown that women have higher cooking skills than men, probably because of their social culture and the traditional division of household labor (Lake *et al.*, 2006; Lyon *et al.*, 2011; Daniels *et al.*, 2012; Hartmann *et al.*, 2013). In many, if not most, families, women are left with the task of preparing meals, increasing their confidence and experience with cooking-related tasks and techniques (Ternier, 2010; Adams and White, 2015; McGowan *et al.*, 2016, 2017; Kowalkowska *et al.*, 2018; Byrd-Bredbenner, 2005; Chenhal, 2010; Zick *et al.*, 2011; Flagg *et al.*, 2014).

Age was positively associated with self-efficacy in the three scales: higher scores were obtained by students aged more than 25 years. A similar finding was reported by Kowalkowska *et al.* (2018), who identified higher self-described cooking skills in Portuguese students aged 30 years or more. Hartmann *et al.* (2013) observed that women in their 30s had higher cooking skills than women in their 20s. Our results corroborate those of other authors

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Variable	<i>n</i>	%
<i>Sex</i>		
Female	457	60
Male	309	40
<i>Age</i>		
≤25 years	670	87
>25 years	96	13
<i>Field of study</i>		
Humanities and Social Sciences	296	39
Exact Sciences	226	29
Life Sciences	244	32
<i>Class schedule</i>		
Full-time	406	53
Mornings/afternoons	240	31
Evenings	120	16
<i>Mother's education level</i>		
High school or less	356	47
Some college education	59	7
University graduate	351	46
<i>Father's education level</i>		
High school or less	382	50
Some college education	65	8.5
University graduate	319	41.5
<i>Living arrangement</i>		
Living arrangement alone	154	20
With parents and/or grandparents	341	45
With others	271	35
<i>Do you know how to cook?</i>		
Yes	549	72
No	217	28
<i>Time available for cooking (daily)</i>		
<1 h	77	10
1–3 h	37	70
>3 h	152	20
<i>Learned to cook from (n = 549)</i>		
Parents, grandparents or other family members	113	21
Friends, cooking classes, school, TV, Internet or alone	33	6
Both options apply	403	73
<i>Where do you usually have your main meal (lunch or dinner)?</i>		
At home	374	49
Away from home	392	51
<i>Where do you usually eat when you are away from home? (n = 392)</i>		
University restaurant	216	55
Pay-by-weight restaurant	23	6
Other <sup>a</sup>	153	39

**Table 1.**  
Sociodemographic and  
lifestyle characteristics  
of first-year university  
students

**Note(s):** <sup>a</sup>Includes respondents who answered yes to both university restaurant and pay-by-weight restaurant or to snack shops, fast food restaurants, coffee shops, packed lunch or parents' home

## Self-efficacy in cooking

Item	Median (p25–75)	Score <sup>a</sup> (%)				
		1	2	3	4	5
<i>Self-efficacy for using basic cooking techniques</i>						
Cook from basic ingredients (e.g. lettuce, tomatoes, raw meat)	4.00 (4.00–5.00)	5	10	10	40	35
Follow a recipe (e.g. prepare a vinaigrette sauce)	4.00 (4.00–5.00)	5	9	11	43	32
Prepare lunch from ingredients you have at home	4.00 (4.00–5.00)	3	7	12	43	35
Use knife skills	4.00 (2.00–4.00)	7	18	23	31	21
Plan nutritious meals	3.00 (2.00–4.00)	9	22	23	28	18
Use simple cooking techniques (e.g. washing, peeling, chopping)	4.00 (3.00–5.00)	3	10	16	37	34
Boiling	4.00 (4.00–5.00)	3	6	10	42	39
Simmering	4.00 (4.00–5.00)	3	6	11	47	33
Steaming	3.00 (2.00–4.00)	12	20	22	26	20
Deep-frying	3.00 (2.00–4.00)	21	26	16	24	13
Sautéing	3.00 (2.00–4.00)	20	23	26	19	12
Stir-frying	4.00 (3.00–5.00)	8	14	14	37	27
Grilling	3.00 (2.00–4.00)	18	17	20	28	17
Poaching	2.00 (1.00–3.00)	27	27	24	13	9
Baking/Roasting	4.00 (4.00–5.00)	3	9	12	42	34
Using a barbecue grill	3.00 (2.00–4.00)	18	23	18	24	17
Stewing	3.00 (2.00–4.00)	14	21	17	26	22
Microwaving	5.00 (4.00–5.00)	3	5	7	30	55
Median (p25–75)	3.55 (3.00–3.94)					
<i>Self-efficacy for using fruits, vegetables and seasonings</i>						
Fresh and frozen vegetables (e.g. broccoli, peas)	4.00 (3.00–5.00)	11	14	14	33	28
Roots and tubers (e.g. beetroot, sweet potatoes)	4.00 (3.00–5.00)	7	10	14	38	31
Fruits (e.g. orange, watermelon)	4.00 (4.00–5.00)	3	6	12	38	41
Herbs (e.g. parsley, green onions)	4.00 (3.00–5.00)	7	9	15	33	36
Spices (e.g. pepper, cinnamon)	4.00 (3.00–5.00)	9	15	19	28	29
Vinegars	3.00 (2.00–4.00)	18	22	26	20	14
Citrus juices	4.00 (3.00–5.00)	7	11	19	33	30
Citrus rinds	3.00 (2.00–4.00)	18	22	27	16	17
Hot sauces (e.g. chili sauce, mustard)	3.00 (2.00–4.00)	19	19	18	24	20
Median (p25–75)	3.55 (2.89–4.11)					
<i>Produce consumption self-efficacy</i>						
Eat fruits and vegetables every day (lunch or dinner)	4.00 (3.00–5.00)	8	15	16	33	28
Eat fruits or vegetables as snacks even if others are eating processed snacks	3.00 (2.00–4.00)	12	20	19	29	20
Eat the recommended three portions of fruits and three portions of vegetables per day	3.00 (2.00–4.00)	22	24	19	20	15
Median (p25–75)	3.33 (2.33–4.66)					
<b>Note(s):</b> <sup>a</sup> Questions were rated on a five-point Likert scale, where 1 = extremely unconfident, 2 = unconfident, 3 = neither confident nor unconfident, 4 = confident, and 5 = extremely confident						

**Table 2.** Descriptive statistics of self-efficacy for using basic cooking techniques, self-efficacy for using fruits, vegetables and seasonings, and produce consumption self-efficacy among first-year university students

who argue that young individuals have low confidence in their cooking skills (Adams and White, 2015; McGowan *et al.*, 2017) and do not cook often at home (Adams and White, 2015; Garcia-González *et al.*, 2018). Caraher and Lang (1999) believe that these characteristics may be due to technological developments in food and meal preparation and the popularization of ready-to-eat and convenience foods, which require less cooking skills to be prepared than unprocessed foods. It is possible that young adults develop cooking skills only when needed, for instance, when they leave their parents' home (Wilson *et al.*, 2017).

Individuals living alone or with people other than their parents and/or grandparents had the highest scores on SECT. Various authors agree that students who do not reside with their families develop more cooking skills than those who do (Daniels *et al.*, 2012; Murray *et al.*, 2016; Wilson *et al.*, 2017; Kowalkowska *et al.*, 2018). Leaving home may favor independence and provide students with the opportunity to improve their cooking skills, prepare their own meals and eat with other people (Daniels *et al.*, 2012; Murray *et al.*, 2016; Wilson *et al.*, 2017).

Variable	SECT		SEFVS		SEPC	
	Median (p25–75)	<i>p</i>	Median (p25–75)	<i>p</i>	Median (p25–75)	<i>p</i>
<i>Sex<sup>a</sup></i>						
Female	3.61 (3.11–4.05)	0.002	3.66 (3.00–4.22)	<0.001	3.33 (2.33–4.33)	0.013
Male	3.44 (2.94–3.88)		3.33 (2.77–4.00)		3.00 (2.33–4.00)	
<i>Age<sup>a</sup></i>						
≤25 years	3.50 (3.00–3.94)	<0.001	3.44 (2.88–4.00)	<0.001	3.33 (2.33–4.00)	0.009
>25 years	3.77 (3.38–4.19)		3.83 (3.44–4.55)		3.66 (2.66–4.66)	
<i>Field of study<sup>b</sup></i>						
Humanities and Social Sciences	3.55 (3.00–3.94)	0.006	3.55 (2.88–4.16)	0.004	3.33 (2.33–4.00)	0.001
Exact Sciences	3.39 (2.94–3.89)		3.33 (2.66–4.55)		3.00 (2.33–3.66)	
Life Sciences	3.66 (3.16–4.05)		3.66 (3.00–4.22)		3.66 (2.66–4.33)	
<i>Father's education level<sup>b</sup></i>						
High school or less	3.55 (3.05–3.94)	0.880	3.55 (2.88–4.11)	0.832	3.33 (2.33–4.00)	0.501
Some college education	3.55 (3.11–4.05)		3.44 (2.88–4.22)		3.33 (2.66–4.33)	
University graduate	3.55 (3.00–4.00)		3.55 (3.00–4.11)		3.33 (2.33–4.00)	
<i>Mother's education level<sup>b</sup></i>						
High school or less	3.50 (3.00–3.88)	0.196	3.55 (2.77–4.00)	0.308	3.00 (2.33–4.00)	0.051
Some college education	3.61 (3.27–4.11)		3.55 (3.00–4.22)		3.66 (2.66–4.33)	
University graduate	3.55 (3.00–4.00)		3.55 (2.88–4.11)		3.33 (2.33–4.00)	
<i>Living arrangement<sup>b</sup></i>						
Alone	3.55 (3.11–3.89)	0.038	3.44 (2.89–4.00)	0.143	3.00 (2.33–4.00)	0.027
With parents and/or grandparents	3.44 (2.94–3.94)		3.44 (2.89–4.11)		3.33 (2.33–4.00)	
With others	3.55 (3.11–4.05)		3.55 (3.00–4.22)		3.33 (2.66–4.33)	
<i>Do you know how to cook?<sup>a</sup></i>						
Yes	3.72 (3.33–4.11)	<0.001	3.77 (3.11–4.33)	<0.001	3.33 (2.66–4.33)	<0.001
No	2.94 (2.44–3.27)		2.89 (2.33–3.55)		3.00 (2.33–3.66)	
<i>Time available for cooking<sup>b</sup></i>						
<1 h	3.16 (2.72–3.72)	0.002	3.22 (2.44–3.77)	0.011	3.00 (2.33–3.66)	0.023
1–3 h	3.55 (3.05–3.94)		3.55 (2.89–4.11)		3.33 (2.66–4.00)	
>3 h	3.61 (3.22–4.11)		3.55 (3.00–4.22)		3.00 (2.00–4.00)	
<i>Learned to cook from<sup>b</sup></i>						
Parents, grandparents or other family members	3.72 (3.33–4.00)	0.709	3.66 (3.11–4.11)	0.381	3.33 (2.33–4.00)	0.551
Friends, cooking class, school, TV, Internet or alone	3.83 (3.33–4.16)		3.77 (3.00–4.22)		3.33 (2.33–4.00)	
Both options apply	3.72 (3.33–4.16)		3.77 (3.11–4.33)		3.33 (2.66–4.33)	
<i>Where do you usually have your main meal?<sup>a</sup></i>						
At home	3.61 (3.11–4.05)	0.003	3.61 (3.00–4.11)	0.042	3.33 (2.33–4.00)	0.393
Away from home	3.44 (2.94–3.88)		3.44 (2.88–4.05)		3.33 (2.33–4.00)	

**Note(s):** <sup>a</sup>Mann–Whitney test. <sup>b</sup>Kruskal–Wallis and post hoc Mann–Whitney test

**Table 3.** Relationship between self-efficacy for using basic cooking techniques (SECT), self-efficacy for using fruits, vegetables, and seasonings (SEFVS), produce consumption self-efficacy (SEPC), and sociodemographic and lifestyle characteristics of first-year students enrolled at a Brazilian university

Knowing how to cook was also positively associated with the three scales of self-efficacy. Most participants who reported that they knew how to cook were confident or extremely confident in cooking from basic ingredients, following a written recipe, using a barbecue



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grill and using fresh and frozen vegetables. No relationship was found between self-efficacy and source of knowledge about cooking. This result differs from that reported by de Backer (2013), who found that the mother is the main source of knowledge about cooking skills. Among students evaluated in the current study, the development of cooking skills seems to be related to their needs and stimuli and not to the source of cooking knowledge. When individuals are responsible for preparing their own meals, they are faced with the need to acquire and improve their cooking skills, be it through websites, television programs, courses, workshops, friends or recipes handed down through generations.

Students living alone had lower scores on SEPC, corroborating studies that show that students who live with their families consume more daily portions of vegetables than those living alone (Sharma *et al.*, 2009; Lupi *et al.*, 2015). This result suggests that the presence of other people may influence fruit and vegetable consumption choice. According to the authors, university students who live with their parents eat more fruits and vegetables probably because they are generally not responsible for purchasing food or preparing meals, and parents provide ongoing support toward healthy eating.

Wilson *et al.* (2017) found that students who live with their parents, spouse or children may develop higher motivation and self-efficacy toward cooking when they are responsible for meal preparation compared with those who live alone. In this scenario, interventions must consider ways to evoke students' interest and increase their motivation to cook.

Colatruglio and Slater (2016) and Hanson (2019) highlighted the importance of targeting first-year university students in intervention programs, as cooking skills and meal planning are associated with increased fruit and vegetable consumption. An alternative to stimulate the consumption of fruits and vegetables is to implement programs that encourage healthy eating, provide knowledge on meal planning and purchase, and teach healthy cuisine.

Another strategy to increase fruit and vegetable consumption by university students, according to Hyldelund and Olsen (2020), is to stimulate the consumption of vegetable-based convenience foods. Such food products are readily available and easy to prepare or ready to eat, facilitating consumption by university students. However, many students were concerned about the sustainability of convenience foods given the high amount of packaging. Nevertheless, vegetable consumption was higher among students who had vegetable-based convenience foods available at home.

Higher SECT scores were observed for individuals who had more than 3 h available per day to cook, whereas SEFVS and SEPC scores were higher for students who had more than 3 h and 1–3 h to cook, respectively.

When analyzing the items that compose the SECT scale, we found that 75% of students were confident and extremely confident in cooking from basic ingredients but only 46% felt the same way about planning nutritious meals. Young adults often find it difficult to separate time for having a meal at home, eating regularly and going to the supermarket. These individuals believe that preparing healthy meals consumes time that could otherwise be spent on other activities (Pelletier and Laska, 2012). This perception may negatively influence students' ability and willingness to plan and prepare meals (Larson *et al.*, 2009). Therefore, lack of time is an important barrier to healthy cooking and eating (Larson *et al.*, 2006; Welch *et al.*, 2009; Lavelle *et al.*, 2016; Mills *et al.*, 2017; Marquis *et al.*, 2018). Driskell *et al.* (2005) pointed out that, because of lack of time, young people choose to eat out, increasing their chances of consuming convenience or fast foods. Their out-of-home food choices will likely depend on the environment, personal preferences and price (Kabir *et al.*, 2018).

Although 72% of the respondents claimed to know how to cook, 51% reported to eat out for lunch or dinner and, of these, 55% did so exclusively at the university restaurant. Ulhoa *et al.* (2015) conducted a survey aimed at identifying the habits and dietary choices of

Brazilian university students during lunch. Cost, location, food variety and balanced or nutritionally adequate meals were the main factors influencing students' choice of eating at university restaurants. According to [Bernardo \*et al.\* \(2017\)](#), university restaurants are part of the food environment of students, especially in public universities. Therefore, university restaurants should be encouraged to provide healthy meals that include fruits, vegetables and whole grains. The university campus may be an excellent environment to encourage health-promoting strategies, such as interventions aimed at student autonomy.

Eating the main meal at home was associated with higher SECT and SEFVS scores. Previous studies have shown that cooking the main meal at home is related to high fruit and vegetable consumption ([Smith \*et al.\*, 2010](#); [Laska \*et al.\*, 2012](#); [Monsival \*et al.\*, 2014](#); [Mills \*et al.\*, 2017](#); [Hanson \*et al.\*, 2019](#)), high self-efficacy in healthy eating ([Chu \*et al.\*, 2012](#)), consumption of nutrient-rich foods ([Wolfson and Bleich, 2015](#); [Larson \*et al.\*, 2006](#)) and low risk of overweight and obesity ([Mills \*et al.\*, 2017](#); [Hanson \*et al.\*, 2019](#)). Such benefits can be attributed to the generally smaller portions eaten at home ([Benton, 2015](#)) and control over the frequency and types of foods consumed in each meal ([St-Onge \*et al.\*, 2017](#)).

Most students felt confident or extremely confident in cooking with fresh and frozen vegetables, roots and tubers, fruits, herbs, and spices and eating fruits and vegetables every day at lunch or dinner. The literature indicates that, among first-year university students, cooking frequently, having cooking skills, and planning meals are associated with a high intake of fruits and vegetables ([Hanson \*et al.\*, 2019](#)).

Students enrolled in life science courses had the highest scores on SEPC and SECT, and those enrolled in humanities and social sciences or life sciences programs had the highest scores on SEFVS. These results may be due to the fact that life science courses generally have a higher number of female students. In our study sample, there were more female than male students, corroborating previous studies on similar topics ([Ansari \*et al.\*, 2012](#); [Lupi \*et al.\*, 2015](#); [Hyldelund \*et al.\*, 2020](#); [Hagmann \*et al.\*, 2020](#)). As previously mentioned, women generally report having higher cooking skills and greater involvement in cooking activities at home, a fact that is related to gender biases in traditional cooking roles.

Enrollment in classes about food, nutrition or health may lead individuals to acquire more knowledge on healthy diets ([Matthews \*et al.\*, 2016](#)) and consume adequate amounts of fruits and vegetables ([Ha and Caine-Bish, 2009](#); [Matthews \*et al.\*, 2016](#)). Likewise, students enrolled in nutrition-related classes generally have higher cooking skills than those who are not enrolled in such classes ([Wilson \*et al.\*, 2017](#); [Seabrook \*et al.\*, 2019](#)). Life science courses in Brazil include health-related classes in their curricula. The knowledge acquired may have led students to become aware of their health and food requirements. This finding demonstrates the importance of courses and interventions aimed at the development of cooking skills for university students, regardless of their field of education. Development of cooking skills, combined with knowledge about food and nutrition, can be a key factor in the formation of healthy eating habits.

Intervention programs on meal preparation allow participants to practice their cooking skills, conferring many benefits to participants ([Reicks \*et al.\*, 2018](#)). We highlight the pioneering program called NCK, aimed at Brazilian first-year university students. The intervention program was effective in increasing cooking skills and maintained a positive impact on participants for six months after the end of the program ([Bernardo \*et al.\*, 2018](#)).

### Limitations

The present study has some limitations that should be taken into account in future studies. The first concerns the study population. Students from a single public university were surveyed; therefore, generalizations cannot be made, and the results may not reflect the reality of university students from different regions of the country. We highlight that

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Southern Brazil has a higher percentage of university students than other regions (Brazil, 2013). A second limitation is that sociodemographic and lifestyle variables were categorized according to data found in the literature. Consequently, interpretation of the questions may vary. For example, the time available for cooking may be interpreted to include the time to prepare a meal or the time to plan, purchase, and prepare and clean the kitchen after use (Smith *et al.*, 2013). In a future study, an explanatory comment can be used to avoid misinterpretations.

To the best of our knowledge, this is the first study conducted with Brazilian university students that identified and related self-efficacy in cooking and consuming fruits and vegetables with sociodemographic and lifestyle factors. The results can contribute to the development of public policies on food and nutrition education in the university setting.

## Conclusions

Brazilian university students show similar levels of self-efficacy for cooking and consuming fruits and vegetables as students from other countries. Female students, individuals aged over 25 years, and students who reported to know how to cook had higher self-efficacy. Students who cooked meals at home had higher SECT and SEFVS scores, suggesting that cooking skills may contribute to consumption of fruits and vegetables. Students enrolled in life science courses had higher self-efficacy scores. No relationship was found between self-efficacy and source of knowledge about cooking. Therefore, the acquisition and development of cooking skills may be related to students' needs and stimuli but not necessarily to the source of cooking knowledge.

In several studies, university students reported that the main barriers to healthy eating are the lack of cooking skills and self-efficacy (Escoto *et al.*, 2012; Lavelle *et al.*, 2016; Murray *et al.*, 2016). This group is commonly overlooked in health promotion strategies. However, public health policies are beginning to consider cooking skills as an aspect of health promotion. Cooking self-efficacy is a key factor in developing healthy eating habits.

The results presented in this study provide valuable information for the development of cooking interventions aimed at promoting the consumption of healthy foods among young adults with low cooking self-efficacy. Age, sex, undergraduate course, living arrangement, cooking skills and home meal preparation are factors that influence self-efficacy in cooking and consuming fruits and vegetables among university students. Male students, individuals aged less than 25 years, and those who report not knowing how to cook should be the focus of interventions aimed at increasing cooking skills, food and nutrition education and healthy eating habits. Promotion of practical cooking skills and critical assessment of nutrition information are important strategies to improve the food skills of university students, especially of first-year students living away from home, and might enable young adults to develop and sustain healthy eating behaviors.

Studies suggesting that there is a possible positive association between knowing how to cook, healthy eating habits and diet quality (Hartmann *et al.*, 2013; Haggmann *et al.*, 2020). Future research should confirm this hypothesis using more precise data on dietary intake.

We highlight that this is the first study that analyze some dimensions that compose of cooking skills (self-efficacy in cooking and consuming fruits and vegetables). This study analyzed the relationship of self-efficacy for cooking and consuming fruits and vegetables with some sociodemographic and lifestyle characteristics of first-year university students. Further studies are needed to investigate the relationship between cooking self-efficacy, food consumption and eating behaviors. We suggest researchers investigate the cooking self-efficacy of university students from different years and different countries and carry out a longitudinal analysis of whether self-efficacy changes over time.

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