Cross-cultural adaptation and validity of a measure to assess food and cooking skills in Portuguese adolescents

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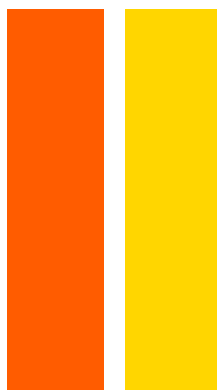
Abstract

Cooking skills are defined as a combination of individuals' confidence, attitude and knowledge in carrying out cooking tasks, involving planning, buying and preparing food. Developing these skills is fundamental to promote better food choices throughout life. Adolescents, who are at a key age for developing healthy behaviours, represent an important target group. It is therefore essential to plan Health Education interventions with this focus, requiring appropriate assessment phases and tools. Therefore, this study aimed to develop and validate an instrument to assess cooking skills in Portuguese adolescents. Given the lack of validated instruments for this population, we decided to translate, cross-culturally adapt and validate a tool for assessing cooking skills in adolescents. In addition, the study explored the associations between cooking skills, sociodemographic data and diet quality.

The cooking skills questionnaire "Cooking with a Chef" (CWC) was translated and adapted for use in Portuguese and administered to 146 high school students, with a two-week interval between assessments. Reproducibility analysis showed significant test-retest differences only in the Availability and Accessibility of Fruits and Vegetables Index (AAFV) section (p = 0.006), while all other sections demonstrated satisfactory to excellent intraclass correlation coefficients. Internal consistency was generally acceptable, except for the AAFV (α = 0.507), Cooking Behaviour (α = 0.479), and Knowledge of Cooking Terms and Techniques Evaluation sections (α = 0.244), which had lower values.

Construct validity was assessed through exploratory factor analysis (EFA) and the known-groups approach. EFA identified underlying factors in each section. Regarding the known-groups, the study found that girls (p = 0.039) and those

highly adhering to the Mediterranean Dietary Pattern (p = 0.006) displayed superior cooking skills. No significant associations were found with parents' education levels or Body Mass Index. However, lower cooking skills were linked to increased soft drink consumption (ρ=-0.218; p = 0.008).

In summary, this study successfully translated, adapted, and validated a Portuguese version of a cooking skills tool for adolescents. The questionnaire demonstrated acceptable reproducibility and validity. This tool shows promise for future research and interventions aimed at enhancing cooking skills among Portuguese adolescents.

Keywords: cooking skills, assessment tool; cross-cultural adaptation; reproducibility; validity; adolescents; Portugal

Resumo

As capacidades culinárias são definidas como uma combinação da confiança, atitude e conhecimento dos indivíduos na execução de tarefas culinárias, envolvendo o planeamento, a compra e a preparação de alimentos. O desenvolvimento destas capacidades é fundamental para promover melhores escolhas alimentares ao longo da vida. Os adolescentes, que se encontram numa idade fulcral para o desenvolvimento de comportamentos saudáveis, representam um grupo-alvo importante. É, por isso, essencial o planeamento de intervenções em Educação para a Saúde com este foco, exigindo fases de avaliação e ferramentas adequadas. Sendo assim, este estudo teve como objetivo desenvolver e validar um instrumento de avaliação das capacidades culinárias em adolescentes portugueses. Dada a falta de instrumentos validados para esta população, optou-se por traduzir, adaptar transculturalmente e validar uma ferramenta de avaliação de capacidades culinárias em adolescentes. Além disso, o estudo explorou as associações entre as capacidades culinárias, os dados sociodemográficos e a qualidade da alimentação.

O questionário de capacidades culinárias "Cooking with a Chef" (CWC) foi traduzido e adaptado para uso em português e aplicado a 146 estudantes do ensino secundário, com um intervalo de duas semanas entre as avaliações. A análise da reprodutibilidade mostrou diferenças significativas no teste-reteste apenas na secção do Índice de Disponibilidade e Acessibilidade de Frutas e Produtos Hortícolas (AAFV) (p = 0,006), enquanto todas as outras secções demonstraram coeficientes de correlação intraclasse satisfatórios a excelentes. A consistência interna foi geralmente aceitável, exceto para as secções AAFV (α

= 0,507), Escala de Comportamentos sobre preparação e confeção de alimentos (α = 0,479) e na Avaliação do Conhecimento sobre Termos e Técnicas de Cozinha (α = 0,244), que apresentaram valores mais baixos.

A validade de construto foi avaliada através da análise fatorial exploratória (AFE) e da abordagem dos grupos conhecidos. A AFE identificou fatores subjacentes em cada uma das secções. No que diz respeito aos grupos conhecidos, o estudo concluiu que as raparigas (p = 0,039) e os indivíduos com elevada adesão ao Padrão Alimentar Mediterrânico (p = 0,006) apresentavam capacidades culinárias superiores. Não foram encontradas associações significativas com os níveis de educação dos pais ou com o Índice de Massa Corporal. No entanto, as capacidades culinárias inferiores estavam associadas a um maior consumo de refrigerantes (ρ=-0,218; p = 0,008).

Em resumo, este estudo traduziu, adaptou e validou com sucesso uma versão portuguesa de um instrumento de capacidades culinárias para adolescentes. O questionário demonstrou reprodutibilidade e validade aceitáveis. Este instrumento é promissor para futuras investigações e intervenções destinadas a melhorar as capacidades culinárias dos adolescentes portugueses.

Palavras-chave: capacidades culinárias; instrumento de avaliação; adaptação transcultural; reprodutibilidade; validade; adolescentes; Portugal

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Introduction

Health education and cooking skills

Chronic non-communicable diseases, such as Diabetes Mellitus and cerebro-cardiovascular diseases, are the main cause of death in Portugal and at European level. (1, 2)

At a national level, in 2021, inadequate eating habits were among the five main risk factors contributing to mortality (11.4%) and loss of healthy life years (7.3%). In addition, there are other relevant risk factors where diet plays a determining role and action is urgently needed, including increased plasma glucose and high body mass index. (3, 4)

Such evidence highlights the enormous importance of health education and the promotion of food literacy among the Portuguese population. Particularly at school age, educating individuals about healthy and balanced eating is fundamental, as small changes can have a big impact on their present and future health; (5, 6) the habits acquired can be maintained in adult life, thus reducing the risk of obesity and promoting overall health. (7)

Food education in young people is usually worked through classroom sessions, promoting their knowledge about food and nutrition. However, it is also important to 'get hands on' and empower adolescents so that the theory is reflected in their behaviour and attitudes. (8) Indeed, promoting health literacy and empowering individuals to make healthy food choices is a strategic area defined by the National Programme for the Promotion of Healthy Eating (PNPAS) for 2022-2030. (9) Furthermore, the national Integrated Strategy for the Promotion of

Healthy Eating (EIPAS) defines food education strategies as actions to develop food preparation and cooking skills in the school environment. (10)

Thus, the development of cooking skills, defined as a combination of confidence, attitude and knowledge of individuals in performing cooking tasks, involving planning, purchasing and preparing food, is an interesting strategy to promote healthy eating habits. (11, 12)

The European Food and Nutrition Action Plan 2015-2020 has long been considering that interventions and initiatives focusing on the capacities of the individual, such as cooking skills, should be valued as they improve simultaneously knowledge, skills and attitudes. (13)

Some studies have shown that its development and application can have numerous health benefits, such as improved dietary quality, weight control, and even longevity. (14-18)

In addition, it promotes a sense of achievement and empowerment in both adults and children. In younger people, in particular, greater participation in meal preparation can lead to a greater sense of empowerment, independence and satisfaction from learning new skills. (18, 19)

The development of cooking skills is important in all age groups, but learning them early in life seems to be associated with better food quality, namely higher intake of vegetables, and cooking habits. (20, 21)

Cooking skills in adolescents and their importance

In the results obtained by the last National Food and Physical Activity Survey 2015/16 (IAN-AF), adolescents had high levels of inadequate intake of fruit and vegetables (78%) and a high average daily intake of snacks, savouries and

pizzas (30.9g/day), sweets, cakes and biscuits (89.8g/day) and soft drinks (161.4g/day). (22)

Bearing in mind that young people are at a pivotal age for developing healthy behaviours with the potential to carry over into adult life, it is important to act to change their eating habits. (23) Moreover, they are at a time in their lives when most of them live with relatives and, in a few years, with the entry into the labour market or university life, they may be faced with their first moment of independence in which they will make their own food and meal choices. In Portugal, in 2019, around 120,000 students were displaced from their homes to study in Higher Education, showing the importance of acting early. (24)

This transition period is also characterised by changes in eating behaviours and an increased risk of weight gain, mainly due to individual factors, including already acquired knowledge and eating habits. (25)

This provides important reasons to assess and develop the cooking skills of young people and to understand their impact on current and future diet quality.

In adolescence, it is possible to positively associate better cooking skills and habits with adherence to the Mediterranean Dietary Pattern (MDP), considered a healthy eating pattern. (26) In fact, there is a positive correlation between high adherence to this pattern and the adolescents' quality of life (27), demonstrating the proximity of MDP to healthy habits.

With regard to maintaining healthy habits, it is possible to associate the learning of cooking skills in adolescents with greater confidence and frequency in cooking meals when they reach adulthood, greater openness to new foods, greater knowledge of food safety and less consumption of fried foods, chocolates or salty foods. (20) It is also interesting to note that among 30-35 year olds with children,

those with better cooking skills at a younger age consume less fast food and have more family meals. (28)

Development of cooking skills in adolescents

Learning cooking skills seems to take place between mother and child, according to several studies, and obtaining information only through the mother is related to better cooking practices and eating habits. (20, 29, 30) However, a reduction in the number and level of meal preparation skills of individuals has been observed, suggesting a reduction in the transfer of learning between mother and child. (20, 31, 32)

A key factor in this reduction is related to social change, where women have more limited time for housework and therefore are less willing to let the child participate in meal preparation. (18, 33) In addition, the frequent consumption of pre-prepared meals and ultra-processed foods reduces cooking skills and, consequently, the transition of knowledge to the new generation. (12)

A study evaluated the cooking habits of adolescents between the seventh and ninth grade in a public school in Portugal, showing that nearly half of the adolescents had never cooked vegetables, fish and soup. (26)

Not allowing young people to experiment and learn how to cook may compromise the acquisition of important skills for their adult and independent life. Therefore, it is crucial to find alternatives to ensure the empowerment of young people in the acquisition and development of these skills, where health education projects can play an important role.

Well-being, health and environment are considered as core competence areas in the profile of students in compulsory education in Portugal, inserted in the

Citizenship and Development curriculum. Students are expected to be responsible and aware that their actions and decisions affect their health, and to take increasing responsibility for taking care of themselves. (34) Therefore, the development of cooking skills can be considered a fundamental foundation for adult life that can be developed in a school context.

In China, a school-based cooking intervention showed important results. Adolescents revealed an improvement in their ability to follow a recipe, prepare and cook food. (35)

It is also interesting to understand that the effects of these projects go beyond food and nutrition. They have the potential to develop social and team-building skills and to involve family and community. (11)

Therefore, there is solid evidence of the importance of implementing health education projects focused on developing cooking skills in young people. However, the construction of an intervention project requires a diagnostic evaluation and an assessment of the results of the interventions implemented. (36)

Methodologies for assessing cooking skills

Currently, there are some questionnaires that assess cooking skills. Most of the existing questionnaires were created to evaluate the impact of specific interventions in this area, and not all of them are validated for the population in question. As an example, the Create Your Own Kai intervention with New Zealand adolescents (37) and the Teen Cuisine intervention for American adolescents (38) used non-validated questionnaires as part of their evaluation process.

Nevertheless, to offer the best possible health evidence and to enable comparisons between groups using a standardised measure designed and adapted to quantify a phenomenon cross-culturally, it is crucial to use validated instruments. This level of specificity provides more assurance that a disease's or its' treatment impacts are reported similarly across international trials or outcome evaluations. (39-43)

There are already some questionnaires validated for different populations, such as in children (44, 45), in adults (46, 47) and in university students (48, 49).

Specifically in Portugal, there are translated and validated questionnaires for university students (50, 51). However, to the best of our knowledge, there is no questionnaire that made the assessment of cooking skills in a comprehensive way and that was used and validated in Portuguese adolescents.

Among the existing questionnaires, the one developed for the "Cooking with a Chef" (CWC) questionnaire (49) stands out for assessing a multitude of components which encompass cooking skills, namely attitudes, behaviours, frequency and degree of confidence in planning and cooking healthy meals, as well as cooking knowledge.

In Brazil, this questionnaire was used for the translation, cross-cultural adaptation and validation process in university students. (42)

Although it was developed and validated for university students, the questionnaire proved to be the best fit for evaluating the population of our study since it provided for the most thorough evaluation of cooking skills. This might be helpful in the context of an intervention since it would allow for the understanding of the target population's reality and the ability to tailor the intervention to meet their needs.

"Cooking with a Chef" questionnaire

Based on an extensive review of the literature, no validated questionnaires were found to evaluate cooking skills of adolescents in Portugal.

The CWC questionnaire was originally created for the impact evaluation of a food education intervention project called CWC at Clemson University, United States, developed with university students. Michaud also validated this tool in this population. (52)

This tool was subsequently improved by adding new questions suggested after Michaud's validation process. (52) It was used as one of the evaluation tools in the studies by Kerrison (2014) and Kerrison, Condrasky and Sharp (2017). (53, 54) Also, Warmin validated this new version in university students, but in an online format. (49, 55)

The most recent and complete version of the questionnaire was the one utilized in the present research. (49) The questionnaire presents sections built for the CWC programme and based on other already existing instruments. It contains six scales, a short index and a knowledge evaluation section, comprising a total of 62 items. Each section aims to assess different behaviours and attitudes towards cooking skills, as described in Table 1. The response options vary between yes/no, Likert scales of agreement ("Strongly disagree" - "Strongly agree"), frequency ("Not at all" - "About everyday") or confidence ("Not at all confident" - "Extremely confident") and multiple choice.

Table 1. Cooking with a Chef questionnaire (CWC)*.

Instruments	Response options	Number of items	Summative scores

Availability and Accessibility of Fruits and Vegetables Index	Yes/ No	8	A lower score is indicative of greater availability or accessibility.
Cooking Attitudes Scale	Strongly disagree To strongly agree	7	A higher score is indicative of a more positive attitude toward cooking activities.
Cooking Behaviors Scale	Not at all to about everyday	10	A higher score is indicative of more frequent at-home cooking activities.
Produce Consumption Self-Efficacy Scale	Not very confident to extremely confident	3	A higher score is indicative of a greater degree of self-efficacy.
Cooking Self-Efficacy Scale	Not very confident to extremely confident	6	
Self-Efficacy for Using Basic Cooking Techniques Scale	Not very confident to extremely confident	12	

Self-Efficacy for Using Fruit, Vegetables, and Seasonings Scale	Not very confident to extremely confident	8	
Knowledge of Cooking Terms and Techniques Evaluation	Multiple choice	8	A higher score is indicative of higher knowledge.

* Adapted from Warmin, A. (2009). Cooking with a chef: A culinary nutrition intervention for college aged students. (Master Thesis). Clemson University.

Objectives

The general aim of this study was to provide a validated tool for assessing cooking skills in Portuguese adolescents.

In a sample of Portuguese adolescents, it was intended to perform the following specific objectives:

- Cross-cultural adaptation of the CWC questionnaire into European Portuguese;

- Evaluation of reproducibility and validity of the Portuguese version of the CWC questionnaire;

- Association of the level of cooking skills obtained with the Portuguese version of the CWC questionnaire with socio-demographic data and diet quality.

Methodology and Results

Translation and Cross-cultural adaptation of a tool to assess cooking skills in Portuguese adolescents

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ABSTRACT

This study aimed to develop and validate a tool for assessing cooking skills in Portuguese adolescents, focusing on their confidence, attitude, and knowledge related to cooking tasks. Given the lack of validated tools for this population, the "Cooking with a Chef" questionnaire was translated, adapted, and validated. Additionally, the study explored associations between cooking skills, sociodemographic data, and diet quality.

The questionnaire was translated and adapted for use in Portuguese and administered to 146 high school students, with a two-week interval between assessments. Reproducibility analysis showed significant test-retest differences only in the Availability and Accessibility of Fruits and Vegetables Index (AAFV) section ($p = 0.006$), while all other sections demonstrated satisfactory to excellent intraclass correlation coefficients. Internal consistency was generally acceptable, except for the AAFV ($\alpha = 0.507$), Cooking Behaviour ($\alpha = 0.479$), and Knowledge of Cooking Terms and Techniques Evaluation sections ($\alpha = 0.244$), which had lower values.

Construct validity was assessed through exploratory factor analysis (EFA) and the known-groups approach. EFA identified underlying factors in each section. Regarding the known-groups, the study found that girls ($p = 0.039$) and those highly adhering to the Mediterranean Dietary Pattern ($p = 0.006$) displayed superior cooking skills. No significant associations were found with parents' education levels or Body Mass Index. However, lower cooking skills were linked to increased soft drink consumption ($\rho=-0.218$; $p = 0.008$).

In summary, this study successfully translated, adapted, and validated a Portuguese version of a cooking skills tool for adolescents. The questionnaire

demonstrated acceptable reproducibility and validity. This tool shows promise for future research and interventions aimed at enhancing cooking skills among Portuguese adolescents.

Introduction

Health education and the promotion of food literacy is of enormous importance. Particularly at school age, educating individuals about healthy, balanced eating is fundamental, as small changes can have a big impact on their health. (1, 2) The habits acquired can be maintained in adult life, thus reducing the risk of obesity and promoting overall health. (3)

Food education in young people is usually worked through classroom sessions, promoting their knowledge about food and nutrition. However, it is also important to 'get hands on' and empower adolescents so that the theory is reflected in their behaviour and attitudes. (4)

Thus, promoting the development of cooking skills, defined as a combination of confidence, attitude and knowledge of individuals in performing cooking tasks, involving planning, purchasing and preparing food, is an interesting strategy to promote healthy eating habits. (5, 6)

The development of this skills is important in all age groups but learning them early in life seems to be associated with better food quality, namely higher intake of vegetables, and cooking habits. (7, 8) There are already interesting results for interventions with adolescents in improving cooking skills and meal preparation, as well as the potential to develop social and team-building skills. (6, 9) Therefore, there is solid evidence of the importance of implementing health education projects focused on developing cooking skills in young people.

However, the construction of an intervention project requires a diagnostic evaluation and an evaluation of the results of the interventions implemented. (10) Currently there are some questionnaires that assess cooking skills, allowing the measurement needed for this evaluation. Most of the existing questionnaires

were created to evaluate the impact of specific interventions in this area, and not all of them were validated for the population in question. (11, 12)

Nevertheless, to offer the best possible health evidence and to enable comparisons between groups using a standardised measure designed and adapted to quantify a phenomenon cross-culturally, it is crucial to use validated instruments. This level of specificity provides more assurance that a disease's or its treatment's impacts are reported similarly across international trials or outcome evaluations. (13-17) In addition, such an instrument might be useful in the context of an intervention as it would allow for an understanding of the target population's reality and the ability to tailor the intervention to their needs. (18) It is also important to consider the psychometric properties of these instruments, through reproducibility and validity, and how these parameters were assessed. (19) Reproducibility is the degree to which an instrument measures accurately, without error and can be measured through internal consistency, test-retest reliability and interrater reliability. (19, 20) Validity is the extent to which an instrument measures what it intends to measure, defined essentially as content validity, construct validity and criterion validity. (19, 21) Content validity determines whether the items constitute a representative sample of all potential items that might measure the construct of interest, often relying on expert judgment. On the other hand, construct validity assesses if a measuring instrument properly measures the theoretical construct it is designed to measure, frequently through assessing its relationship with related variables. At last, criterion validity displays how well the scores on a new measure correlate with scores on existing known measures of the same or similar constructs, considered "gold standard". (19, 21)

Also, it is crucial to consider that every time an instrument is used, its validity must be examined. An instrument may be validated for a certain population and purpose, but it does not guarantee that it will function for all. (22)

That being said, there are some questionnaires validated in children (23, 24), in adults (25, 26) and in university students (27-29).

Specifically in Portugal, there are translated and validated questionnaires for university students (30, 31). However, to the best of our knowledge, there is no tool that made the assessment of cooking skills in a comprehensive way and that was used and validated in Portuguese adolescents.

Thus, the general aim of this study was to provide a validated tool for assessing cooking skills in Portuguese adolescents. It is also intended to associate the level of cooking skills with socio-demographic data and diet quality.

Methodology

After a wide-ranging bibliographic search, the questionnaire developed for the "Cooking with a Chef" (CWC) programme (29), although validated for university students, seemed the most appropriate for the purpose of this study as it stands out for assessing a multitude of components which encompass cooking skills, giving a thorough evaluation.

The CWC questionnaire was originally created for the impact evaluation of a food education intervention project called CWC at Clemson University, United States. (32) In this questionnaire each section aims to assess different behaviours and attitudes towards cooking skills, culminating with a knowledge questionnaire, containing a total of 62 items.

Translation and pre-study evaluation

Although the CWC questionnaire was previously used for translation, cross-cultural adaptation and validation process in Brazilian university students (27), its Brazilian Portuguese language made it impossible to be used in a European Portuguese population. The original English version of CWC questionnaire (29), was then translated and adapted for the European Portuguese language, taking into consideration the recommendations of Beaton DE et. al e Sousa VE et. al. (13, 33) The translation process began with two preliminary translations carried out by two persons who were fluent in both languages. One of them was well informed about the objectives of the study and the intention of each question and the other one was uninformed. (13) The differences found between the two versions were examined and compared with the original version. The process involved a back-translation into the original language by a bilingual native English speaker, who did not have contact with the original version. Also, to achieve a consensual version of the translation, an evaluation was conducted by a group of 3 experts in the field.

Finally, a pre-test was carried out with adolescents of the same age, outside the school context of this study, to allow the evaluation of the questionnaire regarding its understanding, the way it is presented and the time it takes to complete it. No significant difficulties were found.

At last, a version of the CWC questionnaire translated and adapted to Portuguese adolescents was obtained, the cooking skills questionnaire (CSQ), (Annex 1) to be applied and validated in a sample of the Portuguese secondary school student population.

Participants

The municipality of Matosinhos was chosen not only for ease of access but also because the city has one of the highest population densities, which also reflects the heterogeneity of its residents and the prevailing multicultural environment. The chosen secondary school, in turn, is in a highly urbanised area where social housing estates, housing cooperatives and other residential areas coexist. (34) Therefore, every class, from each school year, between the 10th and 12th grade and the vocational education was included. Within the classes, all students (n = 480) were invited to participate.

Formal consent requests were sent to all parents/guardians and authorization was obtained for 288 students – participation rate of 60%.

The sample size should consist of, at least 80 students, considering a desired significance level of 5%, a statistical power of 80% and an expected correlation of 0.3.

This number was reached as out of the 288 students, 171 answered the time 1 questionnaire - 59% participation rate and 146 students finished this questionnaire in its entirety – 51% answer rate. For the time 2 questionnaire, 128 responses were obtained – 44% participation rate – and it was possible to match the data from the time 1 and 2 questionnaires for 83 students. The remaining 45 either didn't respond to the time 2 questionnaire completely or didn't have a correspondent in time 1 questionnaire.

Data collection

Data was gathered during the third term of the academic year 2022/23 using a self-administered online questionnaire. The questionnaire was applied at two

different times to the same sample (time 1 and time 2 questionnaire), two weeks apart, so that reproducibility could be tested. A 2-week gap between tests was deemed large enough to prevent individuals from remembering prior answers but short enough to limit changes in the evaluated skills. (35) Therefore, each participant was associated with a numerical code to be able to pair the questionnaires applied at the two moments.

Personal information, including sex, age, weight, height, later transformed into body mass index (BMI), level of education of both the students and the parents/guardians, household situation and employment status of the parents was gathered for this study, as well as the CSQ obtained through the process of translation and back-translation. Simultaneously, diet quality was assessed through the KIDMED index and the frequency of consumption of ultra-processed foods.

BMI was estimated using the formula [body weight (kg)/height^2 (m)], given the reported weight and height data. The BMI percentiles for sex and age (P) were then calculated using the World Health Organization's reference growth curves for children and adolescents aged 5 to 19 years. (36) Adolescent's BMI was categorised as underweight (P3), normal weight (P3-P85), pre-obesity (P85-P97), or obesity (P>97). As the number of participants in the underweight category was low (n=3), this category was later excluded.

Regarding the education of the parents, students had to indicate whether they had completed the 1st cycle of basic school (6 to 10 years old), 2nd cycle of basic school (10 to 12 years old), 3rd cycle of basic school (12 to 15 years old), high school (15 to 18 years old), post-secondary non-tertiary education or higher education (more than 18 years old). To facilitate analysis, only 3 categories were

used: primary school (including 1st, 2nd and 3rd cycle of basic school), high school and higher education (post-secondary non-tertiary education and higher education).

The KIDMED index, validated for Portuguese adolescents, was applied. (37) This index includes 16 items on food consumption, to which a yes-or-no answer was given. Each statement is classified according to its association with Mediterranean Dietary Pattern (MDP): if it has a negative connotation, it gives -1 point; if it has a positive connotation, it receives +1 point. Finally, the total score ranges from -4 to 12, with adherence being low when the score is 3 or less; moderate when the score is between 4-7 points and high when it is 8 or more. (37)

The students were also asked about the frequency of consumption of ultra-processed foods (Cold meats and sausages; pastry products; breakfast cereals; cooking and biscuits; bread and toasts; soft drinks; yoghurts; flavoured milk). In the absence of a validated scale for this purpose, a question was designed where the most frequently consumed ultra-processed foods in adolescents were presented and the frequency was asked through a nine-possibility scale, from "never or less than once a month" to "six or more times a day". The selected foods were based on the results of the UPPer study - Consumption of ultra-processed foods, nutrient profile and obesity in Portugal, which applied the NOVA classification to the data from the 2015/16 National Food and Physical Activity Survey and identified the consumption of ultra-processed foods in various age groups, including among adolescents. (38) The scale used is the same applied in the Food Frequency Questionnaire validated for the Portuguese population. (39, 40) The frequency of consumption of each category of ultra-processed food

was transformed into "times per week" to facilitate interpretation of the results. Also, a variable was created with the total value of the frequency of consumption of ultra-processed foods.

Coding of the CSQ

First, each of the 8 sections of the CSQ was coded according to the procedure applied for the original authors and other decisions made by the research team when no information was available. (32, 41) In the Availability and Accessibility of Fruits and Vegetables Index (AAFV), answers were coded with 1 for "Yes" and 0 for "No". In the Cooking Attitude (CA) Scale, the answers ranged from 1=Strongly disagree to 5=Strongly agree. For negatively worded statements (questions 1, 3, 5 and 7), the score assignment was reversed. In the Cooking Behaviour (CB) Scale, the answers ranged from 1=Not at all to 5=About every day. Questions 4, 7, 9 and 10 were reverse coded and all the others coded normally. In the Produce Consumption Self-Efficacy scale (SEPC), Cooking Self-Efficacy (SEC) scale, Self-Efficacy for Using Basic Cooking Techniques (SECT) Scale and Self-Efficacy for Using Fruits, Vegetables and seasonings (SEFVS) Scale the answers ranged from 1=Not at all to 5=Extremely confident. At last, in the Knowledge of Cooking Terms and Techniques Evaluation (Knowledge) answers were coded as 1 if correct and as 0 if incorrect or mentioned as "don't know".

For the AAFV index and the Knowledge evaluation, the total score obtained in the section was used. The range of scoring is 0-8 for both sections. For the AAFV index, although different from the original author's analysis, this decision was made to make analysis clearer and simpler. For the scales, the scores obtained

in each question were used. Therefore, the range of scoring for the scales is 1-5. Considering a total score for the CSQ, the maximum possible score is 246.

Statistical analysis

Descriptive statistics consisted of absolute (n) and relative (%) frequencies, means, medians and percentiles (P25; P75). The normality of the variables was studied by analysing skewness and kurtosis, for a sample size greater than 100, and by the Kolmogorov-Smirnov, for a sample size between 30 and 100 to apply the most adequate tests.

To compare the baseline characteristics of the participants who fully filled the time 1 questionnaire with the characteristics of those who didn't fully fill it, Mann-Whitney test or t-test for independent samples and χ2-test, respectively for continuous and categorical variables, was applied.

The reproducibility (agreement and reliability) was examined through comparing test-retest of the CSQ and through internal consistency.

In the AAFV index and Knowledge evaluation sections, the total scores obtained were used and variables were processed as continuous. It is important to note that, when necessary, the results considering the variables as dichotomous from AAFV and Knowledge sections will be presented in an annex. The tests used in this case were McNemar test to determine the differences between the two applications and Kappa statistics to assess reproducibility. (42)

Therefore, for each section, Wilcoxon test or paired t-test was used to assess the differences between the two applications. In addition, intraclass correlation coefficient (ICC) and Cronbach's alpha coefficient was applied to determine reproducibility. (43, 44)

For ICC, the values range from 0 to 1, and ICC<0.4 was considered poor, 0.4 ≤ICC<0.75 satisfactory to good, ICC ≥0.75 excellent, and p value <0.05 as significant correlation. (45, 46)

Cronbach's alpha coefficient was obtained to verify the sections' internal consistency, as other studies that validated the CWC questionnaire have done. (17, 26, 32). Values >0.70 were considered satisfactory for inclusion. (44)

The degree of agreement for the kappa coefficient was categorized as poor (≤0), slight (0.01 to 0.20), fair (0.21 to 0.40), moderate (0.41 to 0.60), good (0.61 to 0.80), or excellent (0.81 to 1). Kappa values range from -1 (complete disagreement) to +1 (perfect agreement). (47)

Construct validity was determined through Exploratory factor analysis (EFA) and the known-groups approach.

EFA, with varimax rotation, was used to evaluate the dimensionality of the items. This analysis was carried out individually for each section of the CSQ. Kaiser-Mayer-Olkin (KMO) of Sample Adequacy and Bartlett's test of sphericity were calculated. KMO must be higher than 0.5 and Bartlett's test must be statistically significant, suggesting that the variables are correlated and suitable for factor analysis. (48, 49) Eigenvalues > 1.0 and a scree plot inspection determined the number of factors extracted. Factor loadings of > 0.35 were considered acceptable. (50)

The known-groups approach is frequently employed when a test can discriminate between a group of individuals known to have a particular trait and a group that does not. This approach is used by comparing these groups, which are expected to differ in their main construct. (35, 51, 52) Considering the literature study on the subject, it is required to define the groups. The sex (male and female) and

adherence to the MDP, as measured by KIDMED (high adherence and low adherence), are the known groups established. The major component is cooking skills, with increased cooking skills likely to be shown in females (53, 54) and people with higher adherence to the MDP (55).

To determine the level of cooking skills, the total score for the CSQ was then divided into terciles: low, medium and high cooking skills.

For the association of CSQ total score with other sociodemographic data and diet quality, Spearman's (ρ) correlation coefficient, The Mann-Whitney test and the One-Way ANOVA test were used. When considering the cooking skills level, Chi-square, for categorical variables, and Mann-Whitney test, for continuous variables, were used.

Afterwards, by grouping participants with low and medium cooking skills into a single category, the total score was turned into a dichotomous variable: "Low/medium cooking skills" (from 0 to 187) and "High cooking skills" (over 188). These categories were used to associate cooking skills level with parents/guardians' education, BMI and consumption of ultra-processed foods.

A p-value < 0.05 was used as the cut-off for statistical significance with a 95% confidence level. All statistical analysis were conducted using SPSS® (IBM SPSS Statistics 27).

Ethical procedures

The study had the approval of the Ethics Committee of the Institute of Public Health of the University of Porto (ISPUP) (nº CE23239).

The Padrão da Légua School Group was contacted and authorised the study to take place in Padrão da Légua Secondary School. (Annex 2)

In addition, an informed consent was requested from the adolescents' parents or guardians explaining the objectives of the study, the procedure that was applied and the purpose of the data collected (Annex 3).

Also, the participants were informed about the voluntary nature of this participation, being able to refuse or abandon, at any time, without any type of consequence. Each adolescent could also, later, freely accept or refuse to participate in the study. They were also informed that the participation in the first application of the questionnaire does not imply the participation in the second.

Authorization for use was requested to the author of the cooking skills questionnaire, Prof. Margaret Condrasky. One of the authors of the KIDMED index validated for Portuguese adolescents is the supervisor of this project. Authorisation for the use of the questionnaire was requested and accepted by this author.

The students' questionnaire was developed and applied anonymously through the LimeSurvey® platform of the University of Porto.

Data was anonymised and the numeric code created was only accessible by the researcher and will be destroyed at the end of the study.

Finally, during the data analysis process, all the information collected was kept in a computer only accessible by password, with the files equally protected, and/or in a locked cabinet located in a secure office space. In this way, the protection and confidentiality of all the information collected is guaranteed.

Results

Sample characteristics

Table 1 shows that the 146 participants were mostly female (65.1%) and aged between 15 and 19 years. Exactly 35.6% were attending the 10th grade, 32.9% the 11th grade, 27.4% the 12th grade and 4.1% the vocational education. Regarding the BMI, the median is within the normal category. Most of the adolescents are Portuguese.

There were no statistically significant differences between students who fully filled the questionnaire and students who did not regarding the sociodemographic characteristics collected. (Table 1)

Table 1. Sample Characteristics of secondary school students from one school group in Matosinhos in the school year 2022/2023.

	Students who fully filled the 1st questionnaire		Students who did not fully fill the 1st questionnaire		
	(n = 146)		(n = 25)		
	n	%	n	%	p
Age (years)	n = 146		n = 25		
Median	16.00		17.00		0.106*
IQR	1		2		
Sex	n = 146		n = 25		
Male	51	34.9	6	24.0	0.284†
Female	95	65.1	19	76.0	
Education level	n = 146		n = 25		
10th grade	52	35.6	7	28.0	0.834†
11th grade	48	32.9	8	32.0	
12th grade	46	31.5	10	40.0	
BMI	n = 141		n = 24		
Median	21.453		21.450		0.978*
IQR	4.1		3.1		
Nationality	n = 142		n = 24		
Portuguese	134	94.4	22	91.7	
Other nationalities	8	5.6	2	8.3	0.639†

n, frequency; %, percentages; BMI, Body Mass Index; * Mann-Witney test; † Qui-square test

Cooking skills

In Table 2, it is possible to observe the average score obtained in each section of the questionnaire, both for males, females and the total sample.

There are statistically significant differences in the AAFV (p = 0.042), CB (p = 0.031), SECT (p = 0.036) and Knowledge (p = 0.008) sections. In the last three, the mean score for females is significantly higher than the mean score for males. In the case of the AAFV section, the mean is significantly higher in males.

Table 2. CSQ evaluation of secondary school students from one school group in Matosinhos in the school year 2022/2023.

| | | Students who fully filled the 1st questionnaire | | | |
| | | (n = 146) | | | |
		n (%)	Mean (SD)	Min - Max	p
AAFV	Total	146 (100)	6.20 (1.45)**	0.25-1.00	
	Male	51 (34.9)	6.53 (1.29)**		**0.042**[†]
	Female	95 (65.1)	6.02 (1.50)**		
CA	Total	146 (100)	3.86 (0.61)	2.14-5.00	
	Male	51 (34.9)	3.82 (0.63)		0.626[†]
	Female	95 (65.1)	3.88 (0.59)		
CB	Total	146 (100)	3.11 (0.48)	2.30-4.70	
	Male	51 (34.9)	3.30 (0.44)		**0.031**[†]
	Female	95 (65.1)	3.47 (0.46)		
SEPC	Total	146 (100)	3.63 (0.87)	1.00-5.00	
	Male	51 (34.9)	3.52 (0.92)		0.236[†]
	Female	95 (65.1)	3.69 (0.83)		
SEC	Total	146 (100)	3.85 (0.78)	1.00-5.00	
	Male	51 (34.9)	3.74 (0.83)		0.192*
	Female	95 (65.1)	3.91 (0.76)		
SECT	Total	146 (100)	3.61 (0.81)	1.00-5.00	
	Male	51 (34.9)	3.44 (0.82)		**0.036***
	Female	95 (65.1)	3.70 (0.80)		
SEFVS	Total	146 (100)	3.51 (0.79)	1.00-5.00	
	Male	51 (34.9)	3.45 (0.86)		0.445*
	Female	95 (65.1)	3.54 (0.74)		
Knowledge	Total	146 (100)	4.16 (1.79)**	0.00-8.00	
	Male	51 (34.9)	3.63 (1.88)**		**0.008**[†]
	Female	95 (65.1)	4.44 (1.68)**		

n, frequency; %, percentages; SD, standard deviation; Min, minimum; Max, maximum; [†]Independent t-test; *Mann-Whitney test; ** These values are the mean of the total score obtained in the section, rather than the mean score for each question;.**p < 0.05**

The mean of the total score of CSQ is 177.4 (24.5), with a range of 98 to 227. By dividing in terciles the final CSQ score, it was possible to define 3 levels of cooking skills. (Table 3)

Table 3. Distribution of CSQ total score in terciles, of secondary school students from one school group in Matosinhos in the school year 2022/2023 (n = 146).

Cooking skills level	n (%)
Low (T1: ≤170)	53 (36.3)
Moderate (T2: 171-187)	45 (30.8)
High (T3: >188)	48 (32.9)

n, frequency; %, percentages; T1, first tercile; T2, second tercile; T3, third tercile

<u>Diet quality</u>

The average KIDMED index score was 6.73 (2.55), with the 46.5% showing moderate adherence to MDP and only 11.1% showing low adherence.

The ultra-processed foods with the highest weekly consumption were biscuits and crackers (6.86 times per week) and breakfast cereals (4.62 times per week). More detailed data is presented in the Appendixes 1 and 2.

Reproducibility study

Table 4 shows that only the AAFV section showed statistically significant differences between the two applications of the CSQ (p = 0.006). This value refers to the final score for this section, but through question-by-question analysis (Appendix 3) only the last question, referring to the presence at home of already prepared and ready-to-use vegetables, showed statistically significant differences between the two applications of the CSQ (p = 0.043), with a further 13.2% of participants responding positively in the second application. Intraclass correlation was satisfactory to good for this section.

Regarding the other sections, none showed statistically significant differences between the first and second application (Table 4). The ICC revealed satisfactory to good or excellent reproducibility (ICC above 0.615). The analysis per question of each section is in Appendixes 4 to 10.

Table 4. Differences and agreement of the scales in the CSQ between applications for secondary school students from one school group in Matosinhos in the school year 2022/2023 (n = 83).

		Mean (SD)	p-value	ICC (95%CI)
AAFV	Test	6.22 (1.39)**	**0.006**	0.486 (0.325-0.626)
	Retest	6.64 (1.24)**		
CA	Test	3.94 (0.61)	0.080*	0.883 (0.842-0.917)
	Retest	3.86 (0.64)		
CB	Test	3.45 (0.44)	0.318*	0.615 (0.489-0.722)
	Retest	3.49 (0.45)		
SEPC	Test	3.66 (0.89)	0.325†	0.831 (0.767-0.881)
	Retest	3.58 (0.86)		
SEC	Test	3.91 (0.77)	0.650*	0.932 (0.908-0.952)
	Retest	3.89 (0.81)		
SECT	Test	3.67 (0.78)	0.973*	0.923 (0.895-0.945)
	Retest	3.67 (0.76)		
SEFVS	Test	3.56 (0.77)	0.780*	0.905 (0.871-0.933)
	Retest	3.55 (0.79)		
Knowledge	Test	4.28 (1.74)**	0.113†	0.687 (0.580-0.776)
	Retest	4.47 (1.74)**		

SD, Standard deviation; ICC, Intraclass correlation coefficient; 95%CI, 95% confidence interval; * Paired t-test; † Wilcoxon test; ** These values are the mean of the total score obtained in the section, rather than the mean score for each question.

Regarding internal consistency, all section presented values above 0.7, apart from AAFV (α = 0.507), CB (α = 0.479) and Knowledge (α = 0.244) that showed low internal consistency. (Table 5)

Table 5. Internal consistency of the sections of CSQ (n=146).

	Cronbach's alpha
AAFV	0.507
CA	**0.783**
CB	0.479
SEPC	**0.748**
SEC	**0.855**
SECT	**0.893**
SEFVS	**0.850**
Knowledge	0.244

α > 0.700

Construct validity

<u>EFA</u>

Availability and Accessibility of Fruits and Vegetables Index (AAFV)

The eight items were retained in 3 factors after EFA, that explained 56% of the variance. (Table 6)

Table 6. Exploratory factor analysis for the AAFV section of the CSQ.

Item number	Scale items	Factor loading*		
		Factor 1	Factor 2	Factor 3
8	In the last week, were there vegetables in your refrigerator already prepared so that they could easily be used in a meal?	**0.750**	0.122	-0.88
3	Did you have fresh (e.g. carrot, lettuce) or cooked (e.g. broccoli, cauliflower) vegetables at your home last week?	**0.645**	-0.278	0.018
7	In the last week, were there fresh cut vegetables in the refrigerator at your home for you to eat?	**0.641**	0.224	0.286
1	Did you have natural fruit juice in your home last week?	-0.120	**0.734**	-0.188
6	In the past week, was there fresh cut fruit in the refrigerator at your home to eat?	0.234	**0.665**	0.456
4	Did you have salad at your home last week?	0.441	**0.454**	-0.155
2	Did you have fresh fruit in your home last week?	-0.197	0.013	**0.781**
5	In the past week, were fruit and vegetables available on the kitchen counter or in another accessible place (other than the refrigerator)?	0.348	-0.249	**0.581**
Cronbach's Alpha (α for the overall scale = 0.507)		**0.498**	**0.394**	**0.166**

*Factor Analysis with Kaiser-Meyer-Olkin = 0.626 and Bartlett's test with p < 0.05

The subscales observed are items 3, 7 and 8 – subscale 1 – items 1, 4 and 6 – subscale 2 – and items 2 and 5 – subscale 3.

Cooking Attitude Scale (CA)

The seven items were retained in 2 factors after EFA, that explained 64% of the variance. (Table 7)

Table 7. Exploratory factor analysis for the CA section of the CSQ.

Item number	Scale items	Factor loading*	
		Factor 1	Factor 2
1	I don't like cooking because it takes too much time.	**0.872**	0.030
3	Cooking is frustrating.	**0.855**	-0.003
5	Cooking is a lot of work.	**0.823**	0.136
7	I think cooking is tiring.	**0.797**	0.231
4	I like to try new recipes.	**0.560**	0.076
6	Making meals at home helps me to eat more healthily.	0.094	**0.795**
2	Home cooked meals are more affordable.	0.081	**0.792**
Cronbach's Alpha (α for the overall scale = 0.783)		**0.852**	**0.445**

The subscales observed are items 1, 3, 4, 5 and 7 – subscale 1 – items 2 and 6 – subscale 2.

Cooking Behaviour Scale (CB)

The seven items were retained in 2 factors after EFA, that explained 64% of the variance. (Table 8)

Table 8. Exploratory factor analysis for the CB section of the CSQ.

Item number	Scale items	Factor loading*		
		Factor 1	Factor 2	Factor 3
5	Reheat leftovers from a home cooked lunch or dinner.	**0.851**	-0.043	-0.048
3	Reheat or use leftover food for another meal.	**0.848**	0.068	-0.029
6	Use leftovers from a home cooked meal for another meal.	**0.746**	0.121	-0.055
2	Prepare meals using convenience products (such as packed salad, pre-prepared mashed potatoes, pre-cut carrots, etc.).	0.032	**0.813**	0.002
8	Combine fresh and convenience products for home meal preparation (i.e. a packaged salad with cooked meat or pasta).	0.220	**0.694**	0.174
1	Prepare meals from basic ingredients (such as fresh produce, raw chicken, etc.)	-0.008	**0.539**	-0.038
10	Dine away from home.	0.111	0.093	**0.743**
9	Eat lunch away from home.	-0.094	0.119	**0.692**
7	Go to a restaurant and bring leftovers from the meal to reheat or reuse at home for another meal.	-0.295	-0.180	**0.630**
4	Eat breakfast away from home.	0.280	-0.376	**0.377**
Cronbach's Alpha (α for the overall scale = 0.479)		**0.769**	**0.513**	**0.440**

*Factor Analysis with Kaiser-Meyer-Olkin = 0.640 and Bartlett's test with p < 0.05

Produce Consumption Self-Efficacy Scale (SEPC)

The three items were retained in 1 factor after EFA, that explained 67% of the variance. (Table 9)

Table 9. Exploratory factor analysis for the SEPC section of the CSQ.

Item number	Scale items	Factor loading*
2	Eat fruit or vegetables as a snack, even if everyone else was eating other snacks.	**0.849**
1	Eat fruit and vegetables at every meal, every day.	**0.821**
3	Eat the recommended 3-5 portions of fruit and vegetables every day (e.g. one soup at lunch and one at dinner and 3 pieces of fruit throughout the day).	**0.775**
Cronbach's Alpha		**0.748**

*Factor Analysis with Kaiser-Meyer-Olkin = 0.676 and Bartlett's test with p < 0.05

Cooking Self-Efficacy Scale (SEC)

The six items were retained in 1 factor after EFA, that explained 58% of the variance. (Table 10)

Table 10. Exploratory factor analysis for the SEC section of the CSQ.

Item number	Scale items	Factor loading*
3	Prepare dinner from the produce you have in your pantry and fridge.	**0.858**
6	Perform basic cooking techniques (e.g. boiling, stewing, grilling, frying).	**0.803**
1	Cook from basic ingredients (e.g. lettuce, fresh tomatoes, raw chicken).	**0.791**
2	Follow a written recipe (e.g. preparing a fresh sauce from tomatoes, onions, garlic and peppers).	**0.713**
4	Use knives correctly in the kitchen.	**0.709**
5	Plan nutritious and healthy meals.	**0.690**
Cronbach's Alpha		**0.855**

*Factor Analysis with Kaiser-Meyer-Olkin = 0.872 and Bartlett's test with $p < 0.05$

Self-Efficacy for Using Basic Cooking Techniques Scale (SECT)

The twelve items indicated to one factor after EFA (Table 11), based on the Cattell's scree plot criterion, therefore preventing rotation. (56)

Table 11. Exploratory factor analysis for the SECT section of the CSQ.

Item number	Scale items	Factor loading*
10	Roast in oven (ex. Meat and potatoes)	**0.829**
2	Simmer (ex. Meat)	**0.825**
7	Grill (ex. Steak)	**0.787**
3	Steam (ex. Broccoli)	**0.764**
1	Boil (ex. Egg)	**0.756**
9	Bake in oven (ex. Cake and bread)	**0.718**
11	Stew (ex. Broad beans and meat)	**0.716**
6	Fry in little oil (ex. Vegetables and chicken)	**0.681**
5	Sauté (ex. Mixed vegetables)	**0.612**
8	Poach (ex. Egg)	**0.551**
4	Fry in plenty of oil (ex. Fried potatoes and rissoles)	**0.563**
12	Microwave cooking (ex. Cake in a mug)	**0.314**
Cronbach's Alpha		**0.893**
Cronbach's Alpha if item 12 is eliminated		**0.900**

*Factor Analysis with Kaiser-Meyer-Olkin = 0.861 and Bartlett's test with $p < 0.05$

Self-Efficacy for Using Fruits, Vegetables and Seasonings Scale (SEFVS)

The eight items indicated to one factor after EFA (Table 12), based on the Cattell's scree plot criterion, therefore preventing rotation. (56)

Table 12. Exploratory factor analysis for the SEFVS section of the CSQ.

Item number	Scale items	Factor loading*
5	Spices (e.g. pepper, cinnamon)	0.834
4	Herbs and spices (e.g. basil, thyme)	0.809
1	Fresh or frozen green vegetables (e.g. broccoli, spinach)	0.781
7	Citrus Juice or zest (e.g. lemon, lime, orange)	0.778
2	Root vegetables (e.g. potatoes, beetroot, sweet potato)	0.727
6	Vinegars	0.562
3	Fruit (e.g. peaches, watermelon)	0.546
8	Hot sauces	0.565
Cronbach's Alpha		0.850

*Factor Analysis with Kaiser-Meyer-Olkin = 0.827 and Bartlett's test with $p < 0.05$

Knowledge of Cooking Terms and Techniques Evaluation (Knowledge)

The eight items indicated to one factor after EFA (Table 13), based on the Cattell's scree plot criterion, therefore preventing rotation. (56)

Table 13. Exploratory factor analysis for the Knowledge section of the CSQ.

Item number	Scale items	Factor loading*
6	What is the correct term to refer to the act of preparing all the ingredients, gathering the kitchen equipment and organising the work area before starting to cook?	0.695
2	If a recipe says to sauté an onion, you should cook it:	0.647
7	To accurately measure 1 cup of orange juice for this recipe I must:	0.565
3	The Juliana cut consists of cutting the food into:	0.527
5	The chicken is roasting when it is being:	0.475
1	Briefly cooking peaches in boiling water and then cooling them in ice water to remove their skins is an example of:	-0.372
8	What is the best utensil to measure the vanilla extract in this recipe?	0.383
4	The water is boiling when:	-0.079
Cronbach's Alpha		0.244
Cronbach's Alpha if item 1 is eliminated		0.497
Cronbach's Alpha if item 4 is eliminated		0.294
Cronbach's Alpha if items 1 and 4 are eliminated		0.552

*Factor Analysis with Kaiser-Meyer-Olkin = 0.586 and Bartlett's test with $p < 0.05$

<u>Known-groups method</u>

Regarding sex differences, considering a total score of the questionnaire, a significantly higher median is observed in females (180.1 vs male: 172.4), with a difference in medians of 13 units (p = 0.039).

Considering terciles of the final score, the present study didn't find significant differences within the levels of cooking skills among male and female. (Table 14)

Table 14. Differences between the male and females' level of cooking skills (n = 146).

		Cooking skills final score*				
		Low n (%)	Medium n (%)	High n (%)	Total n (%)	Chi-square
Sex	Female	28 (19.2%)	33 (22.6%)	34 (23.3%)	95 (65.1%)	0.062
	Male	25 (17.1%)	12 (8.2%)	14 (9.6%)	51 (34.9%)	
	Total	53 (36.3%)	45 (30.8%)	48 (32.9%)	146 (100%)	

n, frequency; %, percentages
* Low cooking skills (final score ≤ 170); Medium cooking skills (final score 171-187); High cooking skills (final score > 188)

Regarding adherence to MDP, statistically significant differences were observed between cooking skills levels (p = 0.006). Figure 1 shows that those with low adherence to the MDP are more often at a low level of cooking skills. The opposite happens with those who have high adherence to MDP. The correlation between
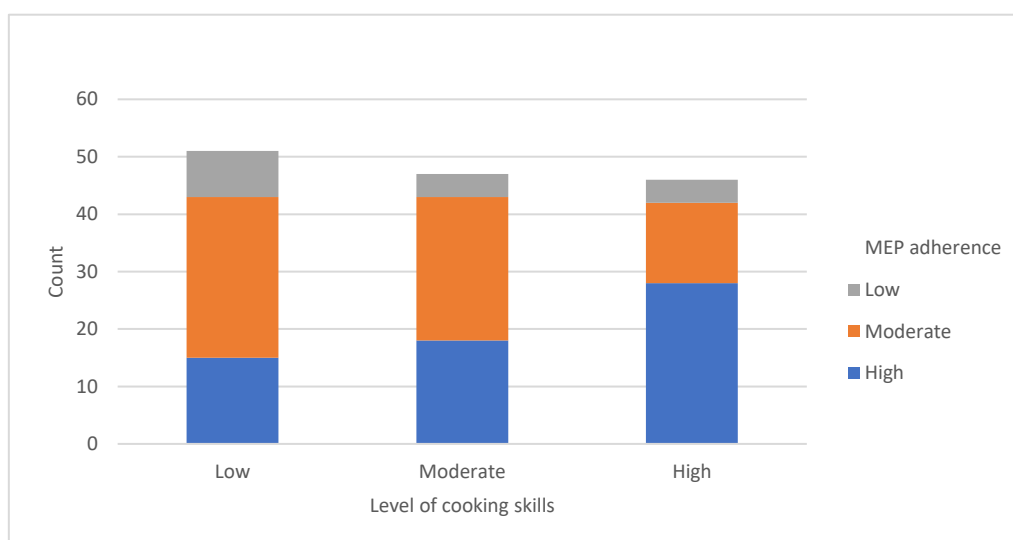

Figure 1. Association between adherence to MDP and level of cooking skills (n=146).

these variables is positive but weak (ρ = 0.320; p <0.001), corroborating the figure.

<u>Association of the level of cooking skills with socio-demographic data, BMI and ultra-processed food consumption</u>

In Tables 16 and 17, for both the educational level of mothers and fathers, there is no significant association with the cooking skills of their children/students. However, it is possible to see greater cooking skills in adolescents with fathers with a higher level of education.

There are no significant differences between the cooking skills score and BMI (p = 0.590), (Table 16) and when considering cooking skills levels there was no significant association either (p = 0.763). (Table 17)

Regarding the frequency of consumption of ultra-processed foods, there was no significant association with cooking skills score or cooking skills levels. However, when analysing each food group, there was a negative, statistically significant but very weak correlation between soft drink consumption and the cooking skills score (ρ=-0.218; p = 0.008). (Table 16)

Table 16. Associations and correlations between cooking skills score and variables of interest: Mother's and Father's education level, BMI classification and frequency of consumption of ultra-processed foods.

		Cooking skills score				
	n (%)	Mean	SD	p	Correlation coefficient	p
n = 83						
Mother's education level						
Primary school	19 (22.9)	176.9	26.56	p=0.216[a]	-	-
High school	24 (28.9)	176.3	23.17			
Higher education	37 (44.6)	183.6	26.40			
Missing	3 (3.6)	-	-			
Total	83 (100)	179.7	25.01	-	-	-
Father's education level						
Primary school	33 (39.8)	176.9	26.99	p=0.601[a]	-	-
High school	24 (28.9)	179.5	24.85			
Higher education	23 (27.7)	184.3	24.21			
Missing	3 (3.6)	-	-			

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Total	83 (100)	179.7	25.01	-	-	-
n = 146						
BMI classification						
Normal weight	115 (78.8)	177.4	24.83	p=0.590*	ρ=0.100	0.240
Pre-obesity and obesity	22 (15.1)	180.4	19.98			
Missing	9 (6.2)	-	-			
UPF						
Charcuterie	-	-	-	-	ρ=0.119	0.154
Pastry products	-	-	-	-	ρ=-0.080	0.336
Breakfast cereals	-	-	-	-	ρ=-0.031	0.715
Cookies and biscuits	-	-	-	-	ρ=0.061	0.466
Bread and toasts	-	-	-	-	ρ=-0.016	0.846
Soft drinks	-	-	-	-	**ρ=-0.218**	**0.008**
Yoghurts	-	-	-	-	ρ=-0.054	0.523
Flavoured milk	-	-	-	-	ρ=-0.037	0.657
Total	-	-	-	-	ρ=-0.083	0.326
Total	146 (100)	177.4	24.51		-	-

BMI, Body Mass Index; UPF, ultraprocessed foods; n, frequency; %, percentages; SD, Standard Deviation; ρ, Spearman's correlation coefficient
[a]One-Way ANOVA; *Independent t-test; **p<0.05**

Table 17. Characterization of the sample according to the cooking skills level.

	Cooking skills level		p
	n (%)		
	Low/medium	High	
n = 83			
Mother's education			
Primary school	15 (78.9)	4 (21.1)	0.309†
High school	17 (70.8)	7 (29.2)	
Higher education	22 (59.5)	15 (40.5)	
Father's education			
Primary school	24 (72.7)	9 (27.3)	0.407†
High school	17 (70.8)	7 (29.2)	
Higher education	13 (56.5)	10 (43.5)	
n = 146			
BMI classification			
Normal weight	77 (67.0)	38 (33.0)	0.763†
Pre-obesity and obesity	14 (63.6)	8 (36.4)	
UPF			
Charcuterie	-	-	0.295*
Pastry products	-	-	0.266*
Breakfast cereals	-	-	0.490*
Cookies and biscuits	-	-	0.846*
Bread and toasts	-	-	0.173*
Soft drinks	-	-	**0.002***

Yoghurts	-	-	0.797*
Flavoured milk	-	-	0.656*
Total	-	-	0.232*

BMI, Body Mass Index; UPF, ultraprocessed foods; n, frequency; %, percentages; †Chi-square; *Mann-Whitney; **p<0.05**

Discussion

The results of this study show that most of the teenagers questioned are at a low (36.3%) or moderate (30.8%) level of cooking skills, with girls generally showing greater abilities (23.3% in girls vs 9.6% in boys showing high values). These results are in line with what has been observed in other studies in the same age group. (55, 57)

Reproducibility

The AAFV section showed statistically significant differences only for the last question, concerning the presence of prepared and ready-to-use vegetables at home, showing that 13.2% changed their answer from NO (test) to YES (retest). All questions were in agreement except for question 2 and 4 of this section.

These two questions relate to the presence of fruit and salad at home in the last week and, because they are the questions with the lowest agreement, it may indicate that participants could have more fruit and vegetables at home at the time of the retest, as observed in Jomori's study. (27)

Regarding the other scales, no significant differences were observed with a two-week interval between questionnaire applications. Similarly, an excellent agreement was observed in almost all sections with a high internal consistency except for the AAFV, CB and Knowledge sections.

Starting with AAFV section, P. Michaud also found a low value. (32). Regarding CB scale, the same was observed in other studies in university students. (17, 32,

41) Michaud's study showed low internal consistency in the CB scale, possibly because it presented only three questions, a different format from the most recent version implemented in the present study.

Warmin subsequently applied this scale with 10 items to university students, however internal consistency does not seem to have been assessed. (41)

Jomori's study presented 11 items in the CB scale and, likewise, found internal consistency values below the acceptable value (0.70). (17)

This could mean that the questions on this scale are measuring different constructs. In fact, this section presents items about eating out, which could be considered another construct. However, considering that eating out more often means preparing and cooking less frequently at home, these questions are also assessing cooking behaviours and, therefore, meet this construct. These items will provide a more comprehensive picture of each person's activities and provide a baseline for how frequently meals are made and consumed both at home and away from home, so P. Michaud suggested that they be included in the section. (32)

Finally, internal consistency, that was low in this study, was not evaluated for the knowledge section in previous studies.

These findings point to the Portuguese version of the CWC questionnaire having satisfactory repeatability over a two-week period.

Validity

EFA

SEPC, SEC and SEFVS

All items of each scale were retained in one factor, presenting acceptable factor loadings and interpretability (SEPC: 0.775-0.849; SEC: 0.690-0.858; SEFVS: 0.546-0.834). Regarding internal consistency, the value for each section is high enough to be satisfactory.

AAFV

The eight items were retained in three subscales, presenting acceptable factor loadings. Subscale 1 – items 3,7 and 8 - groups together questions related to the presence of vegetables in the home that are accessible for use. Subscale 2 – items 1,4 and 6 - refers to foods that require a greater degree of preparation and are therefore ready to eat. Finally, the subscale 3 – items 2 and 5 – asks about the existence of unprepared fruit and vegetables in their natural state at home.

Although the 3 subscales allow for a logic interpretation, in fact, the questions in this section may reveal differences in eating habits between Portugal and the United States of America (USA), especially regarding vegetable consumption. While in Portugal, vegetables are generally eaten cooked or in a soup, in the USA there is a habit of consuming these foods whole or cut up raw, such as carrots, peppers or tomatoes, or in vegetable juice.

Indeed, this information can be confirmed by comparing the food guides of the two countries, since in the USA they state that any vegetable or 100% vegetable juice counts as consumption in this group and vegetables may be raw or cooked, can be fresh, frozen, canned, or dried and can be whole, cut-up, or mashed. (58) In Portugal there is only the suggestion for the consumption of cooked vegetables and soups. (59) Therefore, the existence of the subscale 3 is justified. This scale has a low internal consistency value, however, the internal consistency values for

each sub-scale are even lower, showing that the full scale is more robust in measuring the same construct.

CA

The seven items were retained in two subscales, presenting acceptable factor loadings and interpretability. Subscale 1 – items 1, 3, 4, 5 and 7 – questions about negative attitudes towards the act of preparing and cooking food. In fact, items 1, 3, 5 and 7 were the only reverse coded questions. However, item 4 refers to a positive attitude but is grouped with the negative items. There is no apparent justification for this division. On the other hand, subscale 2 – item 2 and 6 – refers to positive cooking attitudes. The same factors were observed in Michaud's study, with the items 1, 3, 5 and 7 grouped into negative attitudes and items 2, 4 and 6 into positive attitudes. (32) Looking into the internal consistency, subscale 1 presents a higher value than the overall scale, nevertheless, this value was not taken into account because the aim is to administer the scale in its entirety in order to measure the spectrum of attitudes related to cooking. (32)

CB

The ten items were retained in three subscales, presenting acceptable factor loadings and interpretability. Subscale 1 – items 3, 5 and 6 – asks about the use of leftovers in subsequent meals, whether it involves any kind of preparation. Subscale 2 – items 1, 2 and 8 – groups together questions more associated with the act of preparing and cooking, using basic ingredients or convenience products. Finally, the subscale 3 – items 4, 7, 9 and 10 – focuses on eating out. It makes sense for it to be grouped in this way, as these questions are inversely associated with cooking behaviour.

Considering the internal consistency of this scale, the value increases significantly when considering only the first subscale. However, as mentioned above, all the items seem to be important for assessing cooking behaviour.

SECT

The twelve items were retained in a single factor, with acceptable factor loading values apart from item 12 (factor loading = 0.314). Looking at the Cronbach's alpha, the difference in value when eliminating this item is minimal and so it was kept (0.893 to 0.900). However, this might have happened because cooking in the microwave is not yet a common culinary practice among the Portuguese.

Knowledge

The 8 items were retained in a single factor, with acceptable factor loading values for the majority, except for items 1 and 4. This might be due to the fact that the questions that make up this section address specific terms and techniques that would be covered in the CWC project sessions. Their main purpose is to determine the baseline level of cooking knowledge, so they are important questions for the overall evaluation of cooking skills. However, some questions may not reflect the cooking practices of the Portuguese, an issue that should have been considered during the cultural adaptation process. This could be a reason for the low factor loading values.

Nevertheless, when accessing Cronbach's alpha if items 1 or/and 4 were deleted the difference is not notorious. The biggest difference is seen when the two items are eliminated (α = 0.552), but the value is still below acceptable, so eliminating them does not seem justifiable.

Known-groups approach

To assess the validity of the questionnaire, differences in cooking skills scores between sex and level of adherence to MDP were compared.

Firstly, the median of the cooking skills' score for girls was significantly higher than the median for boys, which is in agreement with what was expected and observed in other studies in this age group. (53, 54)

In relation to adherence to MDP, those at a high level of adherence also showed more cooking skills, showing statistically significant differences between MDP adherence levels (p = 0.004). These results are in line with another study where adolescents with higher adherence to this eating pattern cooked better, more often and enjoyed doing so. (55)

These findings point towards a valid measure to evaluate cooking skills in adolescents.

Association between cooking skills and sociodemographic data, nutritional statues and consumption of ultra-processed food

In this part of the study, the only association found with cooking skills was with the consumption of soft drinks. In fact, the same association was found in other study, were helping prepare food for dinner was inversely associated with soft drinks consumption among female adolescents. (57) Utter et al. found a similar result where the consumption of this food group was less likely in adolescents who reported the greatest abilities in cooking. (60)

Although an association with other ultra-processed foods was not observed in this study, the literature has already shown that adolescents with better cooking skills consume less of this food group. (53) Possibly there were no significant differences in this study because of the way the data was collected. Specifically

for estimating consumption of ultra-processed foods, food records and 24-hour recall methods should be used as they are the instruments with the best performance. (61)

Regarding BMI, it is important to note that the results may be influenced by the fact that weight and height are self-reported, since there is a tendency to underestimate weight and exaggerate height, reducing the accuracy of BMI categorization. (62, 63)

Greater or use of more complex cooking skills were associated with a lower BMI in first-year college students. (64, 65) To our knowledge, there are few studies in adolescents that associate cooking skills with BMI. One of them found a positive association between higher abilities and higher BMI, which was unexpected. (60) In fact, the study itself states that it may be due to other environmental factors that influence what teenagers eat and their weight.

There were no differences between parents' levels of education in terms of cooking skills.

In conclusion, there is a need for more studies that measure cooking skills in adolescents and that associate them with other relevant variables.

Limitations and strengths

This study has limitations that should be taken into consideration. Firstly, a convenience sample was used and a small full participation rate was obtained. However, no differences were observed in the main characteristics of participants who fully filled the questionnaire and those who did not. Furthermore, as this is a cross-sectional study, it is important to consider that it does not allow casual relationships to be established.

The main strength of this study is the fact that it is a pioneer in detailing the cross-cultural adaptation of a questionnaire evaluating cooking skills for Portuguese adolescents and assessing these same skills in a sample of high school students. Moreover, the questionnaire was self-administered at both times and with a two-week interval between test-retest. The purpose of this interval was to prevent the participants from remembering their answers and, as a result, the reliability found would not be real. (52, 66)

Conclusion

The Portuguese version of the CWC questionnaire is a tool that may be used to evaluate adolescents' cooking skills, given it has been proven to have adequate reproducibility and validity.

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References

1. Prentice AM, Jebb SA. Obesity in Britain: gluttony or sloth? Bmj. 1995;311(7002):437-9.
2. Samaras K, Kelly PJ, Chiano MN, Spector TD, Campbell LV. Genetic and environmental influences on total-body and central abdominal fat: the effect of physical activity in female twins. Annals of Internal Medicine. 1999;130(11):873-82.
3. World Health Organization. WHO European Regional Obesity Report 2022. Copenhagen: WHO Regional Office for Europe. 2022.
4. Thakur S, Mathur P. Nutrition knowledge and its relation with dietary behaviour in children and adolescents: a systematic review. Int J Adolesc Med Health. 2021;15:192.
5. Jomori M, Vasconcelos F, Bernardo L, Uggioni P, Proença R. The concept of cooking skills: A review with contributions to the scientific debate. Revista de Nutrição. 2018;31:119-35.
6. Utter J, Fay AP, Denny S. Child and youth cooking programs: more than good nutrition? Journal of Hunger & Environmental Nutrition. 2017;12(4):554-80.
7. Lavelle F, Spence M, Hollywood L, McGowan L, Surgenor D, McCloat A, et al. Learning cooking skills at different ages: a cross-sectional study. International Journal of Behavioral Nutrition and Physical Activity. 2016;13(1):1-11.
8. Saxe-Custack A, Egan S, Sadler R, Wojciechowski T. Relative impacts of a virtual cooking and nutrition program for children and families. Appetite. 2023:107041.
9. Zhou W-j, Xu X-l, Li G, Sharma M, Qie Y-L, Zhao Y. Effectiveness of a school-based nutrition and food safety education program among primary and junior high school students in Chongqing, China. Global Health Promotion. 2016;23(1):37-49.
10. O'Connor-Fleming ML, Parker E, Higgins H, Gould T. A framework for evaluating health promotion programs. Health Promotion Journal of Australia. 2006;17(1):61-6.
11. Jackson R. The short-term effects of the COOK intervention on cooking skills and self-efficacy for cooking in New Zealand adolescents: University of Otago; 2018.
12. Price TT, Carrington A-CS, Margheim L, Serrano E. Teen Cuisine: impacting dietary habits and food preparation skills in adolescents. Journal of Nutrition Education and Behavior. 2017;49(2):175-8. e1.
13. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine. 2000;25(24):3186-91.
14. Borsa JC, Damásio BF, Bandeira DR. Adaptação e validação de instrumentos psicológicos entre culturas: algumas considerações. Paidéia (Ribeirão Preto). 2012;22:423-32.
15. Eremenco SL, Cella D, Arnold BJ. A comprehensive method for the translation and cross-cultural validation of health status questionnaires. Evaluation & the health professions. 2005;28(2):212-32.
16. Guillemin F, Bombardier C, Beaton D. Cross-cultural adaptation of health-related quality of life measures: literature review and proposed guidelines. Journal of clinical epidemiology. 1993;46(12):1417-32.

17.   Jomori MM, da Costa Proença RP, Echevarria-Guanilo ME, Bernardo GL, Uggioni PL, Fernandes AC. Construct validity of Brazilian cooking skills and healthy eating questionnaire by the known-groups method. British Food Journal. 2017.

18.   Rootman I, Goodstadt M, Hyndman B. Evaluation in health promotion: principles and perspectives: Copenhagen, Denmark: WHO Regional Office Europe; 2001.

19.   Kimberlin CL, Winterstein AG. Validity and reliability of measurement instruments used in research. American journal of health-system pharmacy. 2008;65(23):2276-84.

20.   de Yébenes Prous MJG, Salvanés FR, Ortells LC. Validation of questionnaires. Reumatología Clínica (English Edition). 2009;5(4):171-7.

21.   Mokkink LB, Terwee CB, Knol DL, Stratford PW, Alonso J, Patrick DL, et al. The COSMIN checklist for evaluating the methodological quality of studies on measurement properties: a clarification of its content. BMC medical research methodology. 2010;10(1):1-8.

22.   Kane MT. Explicating validity. Assessment in Education: Principles, Policy & Practice. 2016;23(2):198-211.

23.   Cunningham-Sabo L, Lohse B. Impact of a school-based cooking curriculum for fourth-grade students on attitudes and behaviors is influenced by gender and prior cooking experience. Journal of nutrition education and behavior. 2014;46(2):110-20.

24.   Dean M, Issartel J, Benson T, McCloat A, Mooney E, McKernan C, et al. CooC11 and CooC7: the development and validation of age appropriate children's perceived cooking competence measures. International Journal of Behavioral Nutrition and Physical Activity. 2021;18(1):1-12.

25.   Barton KL, Wrieden W, Anderson A. Validity and reliability of a short questionnaire for assessing the impact of cooking skills interventions. Journal of Human Nutrition and Dietetics. 2011;24(6):588-95.

26.   Condrasky MD, Williams JE, Catalano PM, Griffin SF. Development of psychosocial scales for evaluating the impact of a culinary nutrition education program on cooking and healthful eating. Journal of nutrition education and behavior. 2011;43(6):511-6.

27.   Jomori MM. Adaptação transcultural e validação de um instrumento de identificação das habilidades culinárias e alimentação saudável em estudantes ingressantes de uma universidade brasileira: Universidade Federal de Santa Catarina; 2017.

28.   Lavelle F, McGowan L, Hollywood L, Surgenor D, McCloat A, Mooney E, et al. The development and validation of measures to assess cooking skills and food skills. International Journal of Behavioral Nutrition and Physical Activity. 2017;14(1):1-13.

29.   Warmin A, Sharp J, Condrasky MD. Cooking with a chef: A culinary nutrition program for college aged students. Topics in Clinical Nutrition. 2012;27(2):164-73.

30.   Kowalkowska J, Poínhos R, Rodrigues S. Cooking skills and socio-demographics among Portuguese university students. British Food Journal. 2018;120(3):563-77.

31.   Costa V, Borrego R, Mateus C, Carolino E, Viegas C. Assessment of food and cooking skills: validation of a Portuguese version of a tool and

characterisation of food and cooking skills in young adults. Portuguese Journal of Public Health. 2023:1-11.

32. Michaud P. Development and evaluation of instruments to measure the effectiveness of a culinary and nutrition education program [Master Thesis]: Clemson University; 2007.

33. Sousa VD, Rojjanasrirat W. Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: a clear and user-friendly guideline. Journal of evaluation in clinical practice. 2011;17(2):268-74.

34. Agrupamento de Escolas de Padrão da Légua. Projeto Educativo 2022/2025 [Internet]. [cited 2023 March 3] Available from: https://www.aeplegua.pt/agrupamentos/documentos_estruturantes-PEA.

35. Streiner DL, Norman GR, Cairney J. Health measurement scales: a practical guide to their development and use: Oxford University Press, USA; 2015.

36. de Onis MO, Borghi E, Siyam A, Nishida C, Siekmann J. Growth reference 5-19 years [Internet] World Health Organization, [cited 2023 August 9]. Available from: https://www.who.int/growthref/who2007_bmi_for_age/en/

37. Rei M, Severo M, Rodrigues S. Reproducibility and validity of the Mediterranean Diet Quality Index (KIDMED Index) in a sample of Portuguese adolescents. Br J Nutr. 2021;126(11):1737-48.

38. Magalhães V, Severo M, Correia D, Torres D, de Miranda RC, Rauber F, et al. Associated factors to the consumption of ultra-processed foods and its relation with dietary sources in Portugal. Journal of nutritional science. 2021;10:e89.

39. Lopes C, Aro A, Azevedo A, Ramos E, Barros H. Intake and adipose tissue composition of fatty acids and risk of myocardial infarction in a male Portuguese community sample. Journal of the American Dietetic Association. 2007;107(2):276-86.

40. Lopes C. Alimentação e enfarte agudo do miocárdio: um estudo caso-controlo de base populacional. (Reprodutibilidade e validação do questionário semiquantitativo de frequência alimentar) [Doctoral thesis]: Universidade do Porto; 2000.

41. Warmin A. Cooking with a chef: A culinary nutrition intervention for college aged students [Master Thesis]: Clemson University; 2009.

42. Sim J, Wright CC. The kappa statistic in reliability studies: use, interpretation, and sample size requirements. Physical therapy. 2005;85(3):257-68.

43. Fleiss JL, Cohen J. The equivalence of weighted kappa and the intraclass correlation coefficient as measures of reliability. Educational and psychological measurement. 1973;33(3):613-9.

44. Bland JM, Altman DG. Statistics notes: Cronbach's alpha. Bmj. 1997;314(7080):572.

45. Bland J, Altman D. A note on the use of the intraclass correlation coefficient in the evaluation of agreement between two methods of measurement. Computers in biology and medicine. 1990;20(5):337-40.

46. Marx RG, Menezes A, Horovitz L, Jones EC, Warren RF. A comparison of two time intervals for test-retest reliability of health status instruments. Journal of clinical epidemiology. 2003;56(8):730-5.

47.   Landis JR, Koch GG. The measurement of observer agreement for categorical data. biometrics. 1977:159-74.

48.   Kaiser HF. A second generation little jiffy. Psychometrika. 1970;35:401-15.

49.   Bartlett MS. Tests of significance in factor analysis. British journal of psychology. 1950.

50.   Comrey A, Lee H. Interpretation and application of factor analytic results. Comrey AL, Lee HB A first course in factor analysis. 1992;2:1992.

51.   Davidson M. Known-groups validity. Encyclopedia of quality of life and well-being research. 2014:3481-2.

52.   Di Iorio CK. Measurement in health behavior: methods for research and evaluation: John Wiley & Sons; 2006.

53.   Marconi S, Covolo L, Marullo M, Zanini B, Viola GCV, Gelatti U, et al. Cooking skills, nutrition knowledge and eating behaviours among Italian adolescents during COVID-19 pandemic: results from the online survey COALESCENT (Change amOng ItAlian adoLESCENTs) [Abstract]. Journal of Integrative and Complementary Medicine. 2022;29:63-8.

54.   LeBlanc J, Ward S, LeBlanc CP. The association between adolescents' food literacy, vegetable and fruit consumption, and other eating behaviors. Health Education & Behavior. 2022;49(4):603-12.

55.   Leal F, Oliveira B, Rodrigues S. Relationship between cooking habits and skills and Mediterranean diet in a sample of Portuguese adolescents. Perspectives in Public Health. 2011;131(6):283-7.

56.   Cattell RB. The scree test for the number of factors. Multivariate behavioral research. 1966;1(2):245-76.

57.   Larson NI, Story M, Eisenberg ME, Neumark-Sztainer D. Food preparation and purchasing roles among adolescents: associations with sociodemographic characteristics and diet quality. Journal of the American Dietetic Association. 2006;106(2):211-8.

58.   US Department of Agriculture. MyPlate: A guide to healthy eating [Internet]. [cited 2023 September 1]. Available from: https://www.myplate.gov/

59.   Nova Roda dos Alimentos [Internet]. Faculdade de Ciências da Nutrição e Alimentação da Universidade do Porto, [cited 2023 August 17] Available from: https://alimentacaosaudavel.dgs.pt/roda-dos-alimentos/

60.   Utter J, Denny S, Lucassen M, Dyson B. Adolescent Cooking Abilities and Behaviors: Associations With Nutrition and Emotional Well-Being. J Nutr Educ Behav. 2016;48(1):35-41.e1.

61.   Food, Agriculture Organization of the United Nations. Guidelines on the collection of information on food processing through food consumption surveys. FAO, Rome. 2015.

62.   Bowring AL, Peeters A, Freak-Poli R, Lim MS, Gouillou M, Hellard M. Measuring the accuracy of self-reported height and weight in a community-based sample of young people. BMC medical research methodology. 2012;12(1):1-8.

63.   De Vriendt T, Huybrechts I, Ottevaere C, Van Trimpont I, De Henauw S. Validity of self-reported weight and height of adolescents, its impact on classification into BMI-categories and the association with weighing behaviour. International journal of environmental research and public health. 2009;6(10):2696-711.

64.   Hanson AJ, Kattelmann KK, McCormack LA, Zhou W, Brown ON, Horacek TM, et al. Cooking and meal planning as predictors of fruit and vegetable intake

and BMI in first-year college students. International journal of environmental research and public health. 2019;16(14):2462.

65.   da Costa Pelonha RN, Jomori MM, Maciel TG, Rocha JAD, Passos TS, Maciel BLL. Low Cooking Skills Are Associated with Overweight and Obesity in Undergraduates. Nutrients. 2023;15(11):2424.

66.   de Vaus D. Surveys in social research: Routledge; 2013.

Annex 1 – CSQ (Portuguese version of the CWC questionnaire)

1. Índice de Disponibilidade e Acessibilidade de Fruta e Hortícolas

DIREÇÕES: Esta secção é sobre a presença de fruta e hortícolas em tua casa durante a semana passada. Por favor, escolhe SIM ou NÃO para cada pergunta.

	SIM	NÃO
1. Tinhas sumo de fruta (natural ou 100%) em tua casa na semana passada?		
2. Tinhas fruta fresca em tua casa na semana passada?		
3. Comeste produtos hortícolas crus ou cozinhados em tua casa na semana passada?		
4. Comeste salada em tua casa na semana passada?		
5. Na última semana havia fruta e hortícolas disponíveis no balcão da cozinha ou noutro local acessível (que não no frigorífico)		
6. Na última semana havia sumo de fruta (natural ou 100%) ou fruta fresca cortada de fácil acesso no frigorífico de tua casa?		
7. Na última semana, havia produtos hortícolas frescos cortados de fácil acesso no frigorífico de tua casa?		
8. Na última semana, havia no frigorífico de tua casa produtos hortícolas já preparados para que pudessem ser facilmente utilizados numa refeição?		

2. Escala de Atitudes sobre preparação e confeção de alimentos

DIREÇÕES: Para cada item abaixo, indica até que ponto concordas ou discordas com as declarações sobre o ato de cozinhar.

	Discordo totalmente	Discordo	Não concordo nem discordo	Concordo	Concordo totalmente
1. Não gosto de cozinhar porque é necessário muito tempo.					
2. As refeições feitas em casa são de preço mais acessível.					
3. Cozinhar é frustrante.					
4. Gosto de experimentar novas receitas.					
5. Cozinhar dá demasiado trabalho.					
6. Fazer refeições em casa ajuda-me a comer de forma mais saudável.					
7. Acho que cozinhar é cansativo.					

3. Escala de Comportamentos sobre preparação e confeção de alimentos

DIREÇÕES: Durante o mês passado, com que frequência fizeste o seguinte?

	Nenhuma vez	1 a 2 vezes este mês	Uma vez por semana	Várias vezes a cada semana	Praticamente todos os dias
1. Preparar refeições a partir de ingredientes básicos (tal como produtos frescos, frango cru, etc.)					
2. Preparar refeições usando produtos de conveniência (tais como salada embalada, puré de batata pré-preparado, cenoura pré-cortadas, etc.).					
3. Reaquecer ou utilizar sobras de alimentos noutra refeição.					
4. Tomar o pequeno-almoço longe de casa.					
5. Reaquecer sobras de um almoço ou jantar cozinhado em casa.					
6. Utilizar sobras de uma refeição cozinhada em casa num prato novo.					
7. Utilizar sobras de uma refeição fora de casa num prato novo.					
8. Utilizar artigos frescos e de conveniência em combinação para a preparação de refeições caseiras (ou seja, uma salada grande com carne cozinhada ou prato de massa).					
9. Comer o almoço fora de casa.					
10. Comer o jantar fora de casa.					

4. Escala de auto-eficácia do consumo de fruta e produtos hortícolas

DIREÇÕES: Para cada item abaixo, indica até que ponto te sentes confiante para realizar a atividade em particular. Seleciona UMA opção para cada pergunta.

	Nada confiante	Não muito confiante	Nem confiante nem não confiante	Confiante	Extremamente confiante
1. Comer frutas e hortícolas em todas as refeições, todos os dias.					
2. Comer frutas ou hortícolas como um lanche, mesmo que todos os outros comessem outros lanches.					
3. Comer diariamente os 400g de frutas e hortícolas que são recomendados.					

5. Escala de auto-eficácia na preparação e confeção de alimentos

DIREÇÕES: Para cada item abaixo, indica a extensão até que te sentes confiante sobre a realização da atividade em particular. Seleciona UMA caixa para cada pergunta.

	Nada confiante	Não muito confiante	Nem confiante nem não confiante	Confiante	Extremamente confiante
1. Cozinhar a partir de ingredientes básicos (ex. alface inteira, tomate fresco, frango cru).					
2. Seguir uma receita escrita (por exemplo, preparação de um molho fresco a partir de tomate, cebola, alho, pimentos jalapeno).					
3. Preparar o jantar a partir dos artigos que tens na tua despensa e frigorífico.					
4. Usar corretamente facas na cozinha.					
5. Planear refeições nutritivas.					

6. Usar técnicas culinárias básicas.					

6. Escala de auto-eficácia no uso de técnicas culinárias básicas

DIREÇÕES: Para cada item abaixo, indicar até que ponto te sentes confiante na realização de uma atividade em particular. Seleciona UMA opção para cada pergunta.

	Nada confiante	Não muito confiante	Nem confiante nem não confiante	Confiante	Extremamente confiante
1. Cozer					
2. Cozer em lume brando					
3. Cozer no vapor					
4. Fritar em óleo abundante (ex. batatas fritas, rissóis)					
5. Saltear					
6. Fritar em pouco óleo (ex. vegetais, frango)					
7. Grelhar					
8. Escalfar					
9. Cozer no forno (ex. bolo, pão)					
10. Assar no forno (ex. carne ou batatas)					
11. Guisar					
12. Cozinhar no microondas					

7. Escala de auto-eficácia no uso de frutas, hortícolas e temperos

DIREÇÕES: Para cada item abaixo, indica até que ponto te sentes confiante sobre a realização de uma atividade em particular. Seleciona UMA opção para cada pergunta.

	Nada confiante	Não muito confiante	Nem confiante nem não confiante	Confiante	Extremamente confiante
1. Hortícolas verdes frescos ou congelados (ex. brócolos, espinafres)					

2. Tubérculos (ex. batatas, beterraba, batata-doce)					
3. Frutas (ex. pêssegos, melancia)					
4. Ervas e especiarias (ex. manjericão, tomilho)					
5. Especiarias (ex. pimenta de Cayenne, canela)					
6. Vinagres					
7. Sumo ou raspa de citrinos					
8. Molhos picantes					

8. Avaliação do Conhecimento sobre Termos e Técnicas de Cozinha

DIREÇÕES: Para as perguntas abaixo, indica qual é a melhor resposta, marcando a caixa ao lado com a tua resposta. Seleciona UMA resposta para cada pergunta.

1. Cozinhar brevemente pêssegos em água a ferver e depois arrefecê-los em água com gelo para lhes remover as peles é um exemplo de:

Por favor, escolhe apenas uma das seguintes:

- Escaldar   - Escalfar   - Assar   -Não sei responder.

2. Se uma receita te diz para saltear uma cebola, deves cozinhá-la:

Por favor, escolhe apenas uma das seguintes:

-Num recipiente colocado acima da água a ferver.
-Numa frigideira com uma pequena quantidade de óleo quente.
-Numa frigideira com uma pequena quantidade de água.
-Não sei responder.

3. Uma batata aos cubos deve ser cortada em:

Por favor, escolhe apenas uma das seguintes:

- Pedaços longos e finos do tamanho de fósforos.   -Pedaços muito pequenos e irregulares.
-Cubos, normalmente de 5 a 20 mm de tamanho.   -Não sei responder.

4. A água está a ferver quando:

Por favor, escolhe apenas uma das seguintes opções:

- O vapor começa a formar-se.
-Pequenas bolhas se juntam no fundo e nos lados da panela.
- As bolhas sobem rapidamente e se desfazem na superfície.
- Não sei responder.

5. A batata-doce está a assar quando está a ser:

Por favor, escolhe apenas uma das seguintes opções:

- Cozinhada por calor seco em forno quente.
- Cozinhada num forno quente com líquido na panela.
- Cozinhada numa panela coberta com uma pequena quantidade de líquido.
- Não sei responder.

6. Qual é o termo mais adequado para a preparação de todos os ingredientes, juntamente com o equipamento e a organização da área de trabalho, antes de se começar a cozinhar?

Por favor, escolhe apenas uma das seguintes opções:

- Fase de produção   - Fase de arrumação   - Fase de preparação   -Não sei responder

RECEITA

DIREÇÕES: Para as perguntas que se seguem, utiliza a seguinte receita para indicar o que acreditas ser a melhor resposta. Seleciona UMA resposta marcando a caixa ao lado com a tua resposta.

Batido de Laranja

1 chávena de iogurte de baunilha sem gordura

½ chávena de batata-doce, cozinhada, arrefecida e amassada

1 chávena de sumo de laranja

½ colher de chá de extrato de baunilha

1 chávena de gelo

Num liquidificador, esmagar o gelo. Acrescentar os ingredientes restantes e misturar bem até ficar líquido. Servir imediatamente. Dá para 2 pessoas.

1. Para medir com precisão 1 chávena de sumo de laranja para esta receita:

Por favor, escolhe apenas uma das seguintes opções:

- Coloque um copo de medição para líquidos numa superfície plana, dobre-se, e verta o sumo até ao nível desejado.

- Segure um copo de medição para secos ao nível dos olhos e verta o sumo de outro recipiente até ao nível desejado.

- Coloque um copo de medição para secos numa superfície plana, dobre-se, e verta o sumo até ao nível desejado.

- Não sei responder.

2. O que é melhor para medir o extrato de baunilha nesta receita?

Por favor, escolhe apenas uma das seguintes opções:

- Colheres de medição

- Copo de medição

- Colher pequena

- Não sei responder

DECLARAÇÃO

Cláudia Jorge Paulino e Pessoa, aluna do Mestrado de Educação para a Saúde pela Faculdade de Medicina e Faculdade de Psicologia e Ciências da Educação da Universidade do Porto (FMUP e FPCEUP), encontra-se a desenvolver uma dissertação de mestrado, sob a orientação da Professora Sara Rodrigues, cujo tema é "Cross-cultural adaptation and validity of a measure to assess food and cooking skills in Portuguese adolescents".

A presente investigação científica tem como finalidade traduzir e validar um questionário de avaliação das capacidades culinárias em adolescentes portugueses.

De forma a poder realizar este trabalho, solicita-se a autorização para a aplicação de um questionário aos estudantes do ensino secundário da Vossa instituição, em dois momentos diferentes.

Serão tomadas as medidas adequadas para a garantia do anonimato e confidencialidade.

Os dados recolhidos serão tratados de acordo com a legislação nacional e da UE aplicável e apenas serão usados pelos investigadores para os fins de investigação científica no âmbito do Mestrado de Educação para a Saúde da FMUP e FPCEUP.

Os resultados serão disseminados sob a forma de comunicações em congressos/reuniões científicas e em publicação científica.

Após a leitura da informação, eu, Isabel Maria Pereira Antunes Morgado, Diretora do Agrupamento de Escolas de Padrão da Légua, declaro que autorizo, para os devidos efeitos, a realização do trabalho proposto, na Escola Básica e Secundária de Padrão da Légua.

Padrão da Légua, 18 de janeiro de 2023

Assinado por: **ISABEL MARIA PEREIRA ANTUNES MORGADO**
Num. de Identificação: 06065367
Data: 2023.01.18 21:50:57+00'00'

(Isabel Maria Pereira Antunes Morgado)

Annex 3 - Informed consent

ISPUP
INSTITUTO DE SAÚDE PÚBLICA
DA UNIVERSIDADE DO PORTO

CONSENTIMENTO INFORMADO PARA PARTICIPAÇÃO EM PROJETO DE INVESTIGAÇÃO E TRATAMENTO DE DADOS
DE ACORDO COM O REGULAMENTO GERAL DE PROTEÇÃO DE DADOS, A DECLARAÇÃO DE HELSÍNQUIA E A CONVENÇÃO DE OVIEDO.

Por favor, leia com atenção a seguinte informação. Se achar que algo está incorreto ou pouco claro, não hesite em pedir mais informações através do e-mail: claudiapessoa27@gmail.com

Se aceitar participar neste estudo solicitamos que preste o seu consentimento, assinando o documento no final.

A participação no estudo é voluntária. Pode a qualquer altura cessar a sua participação, sem qualquer tipo de consequência, bastando para isso contactar o responsável através do e-mail acima.

1.INFORMAÇÃO SOBRE O ESTUDO

Título: Adaptação transcultural e validação de uma medida de avaliação das capacidades culinárias em adolescentes portugueses

Entidade Responsável: ISPUP (Instituto de Saúde Pública da Universidade do Porto), FMUP (Faculdade de Medicina da Universidade do Porto) e FPCEUP (Faculdade de Psicologia e Ciências da Educação da Universidade do Porto)

Responsável Direto: Cláudia Pessoa (claudiapessoa27@gmail.com)

Descrição Geral do Projeto: No âmbito do Mestrado de Educação para a Saúde, este projeto tem como principal objetivo fornecer uma ferramenta traduzida e validada para avaliar as capacidades culinárias dos adolescentes portugueses. Para isso, será aplicado um questionário de autopreenchimento online a estudantes do ensino secundário de um Agrupamento de Escolas de Matosinhos.

A cada participante pede-se que responda a um questionário em dois momentos diferentes, com um intervalo de 2 semanas. Cada participante será associado a um código numérico para que seja possível emparelhar os questionários aplicados nos dois momentos. Os dados serão anonimizados e o código criado só será acessível pelo investigador e destruído no final do estudo.

Condições e financiamento: Este estudo é de carácter voluntário e é possível a recusa ou desistência a qualquer momento sem qualquer tipo de consequência ou prejuízo para o participante.

Este estudo mereceu o parecer positivo da Comissão de Ética do Instituto de Saúde Pública da Universidade do Porto (ISPUP).

2.TRATAMENTO DE DADOS PESSOAIS

Objetivos do Projeto:
- Tradução e validação de uma ferramenta para avaliação das capacidades culinárias em adolescentes portugueses;
- Associação do nível de capacidades culinárias com dados sociodemográficos e qualidade da alimentação.

Dados Pessoais:
Serão recolhidas informações sobre o sexo, a idade, o ano escolar que frequentam, o agregado familiar bem como as habilitações literárias e a situação perante o trabalho dos pais. Simultaneamente serão avaliadas as capacidades culinárias e a adesão à Dieta Mediterrânica. Estes dados serão recolhidos através de um questionário que será aplicado duas vezes com 2 semanas de intervalo.

Finalidade do tratamento:
Os dados recolhidos serão tratados de acordo com a legislação nacional e da UE aplicável e apenas serão usados pelos investigadores para fins de investigação científica.

Responsável pelo Tratamento:
ISPUP – Instituto de Saúde Pública da Universidade do Porto, Rua das Taipas nº135, 4050-600 Porto, Portugal.
FMUP – Faculdade de Medicina da Universidade do Porto, Alameda Prof. Hernâni Monteiro, 4200-319 Porto, Portugal.
FPCEUP – Faculdade de Psicologia e Ciências da Educação da Universidade do Porto, R. Alfredo Allen, 4200-135 Porto, Portugal.

Conservação dos Dados Pessoais:
Os dados recolhidos serão guardados num computador apenas acessível por palavra-passe e todos os documentos serão igualmente protegidos. Apenas a equipa de investigação terá acesso à informação dos participantes.

No final do projeto, os questionários serão destruídos e a base de dados será mantida por um período de 1 ano.
No caso de desistência, toda a informação será eliminada.

Partilha de Dados Pessoais:
Os dados recolhidos serão usados exclusivamente para fins de investigação. Os resultados serão disseminados sob a forma de comunicações em congressos/ reuniões científicas e em publicação científica.

Encarregado de Proteção de Dados:
Para quaisquer questões relativas ao tratamento de dados pessoais, contacte por favor, o nosso encarregado da proteção de dados através do endereço: dpo@ispup.up.pt

Direitos do Titular dos Dados:
Enquanto titular dos dados, a lei reconhece-lhe os seguintes direitos: Informação, Acesso, Retificação, Apagamento, Portabilidade e Limitação do tratamento. Para o exercício de algum dos seus direitos utilize o seguinte endereço de e-mail: claudiapessoa27@gmail.com

A lei confere-lhe, igualmente, o direito de apresentação de queixas perante uma Autoridade europeia de supervisão, sendo que em Portugal a Autoridade competente é a Comissão Nacional de Proteção de Dados (www.cnpd.pt).

3.TERMO DE CONSENTIMENTO INFORMADO

1. Li e compreendi a informação sobre o projeto, incluindo a identidade do Responsável, o tipo de dados que vai ser recolhido, o objetivo da recolha e do respetivo tratamento. ☐
2. Li e compreendi a informação sobre como os dados pessoais serão armazenados e durante quanto tempo, incluindo o que acontecerá aos meus dados no caso de desistir de participar no projeto. ☐
3. Foi-me dada a oportunidade de fazer perguntas e de esclarecer todas as dúvidas sobre este projeto. ☐
4. Compreendo que posso desistir da participação no estudo em qualquer momento, sem necessitar de dar justificações e sem que sofra penalizações ou que questionem as minhas razões. ☐
5. Percebi de que forma poderei comunicar a minha desistência, bem como exercer os meus direitos enquanto titular dos dados pessoais. ☐

O Participante:

Declaro ter lido e compreendido este documento, bem como as informações verbais que me foram fornecidas previamente.

Desta forma, aceito participar neste estudo e permito a utilização dos dados que forneço de forma voluntária.

Nome: ... ...

Assinatura: ... ...   Data: ...... /...... /...........

O Encarregado de Educação (caso o participante tenha menos de 18 anos):

Nome: ... ...

Grau de parentesco ou tipo de representação: ... ...

Assinatura: ... ...

ESTE DOCUMENTO É COMPOSTO DE **2** PÁGINAS E É FEITO EM DUPLICADO:
UMA VIA PARA A INVESTIGADORA, OUTRA PARA A PESSOA QUE CONSENTE.

Appendix 1 – Answers to the KIDMED Index questions.

Table 1. Answers to the KIDMED index questions.

		n	%
Question 1	Yes	112	77.8
	No	32	22.2
	Total	144	100.0
Question 2	Yes	61	42.4
	No	83	57.6
	Total	144	100.0
Question 3	Yes	107	74.3
	No	37	25.7
	Total	144	100.0
Question 4	Yes	64	44.4
	No	80	55.6
	Total	144	100.0
Question 5	Yes	97	67.4
	No	47	32.6
	Total	144	100.0
Question 6	Yes	35	24.3
	No	109	75.7
	Total	144	100.0
Question 7	Yes	93	64.6
	No	51	35.4
	Total	144	100.0
Question 8	Yes	135	93.8
	No	9	6.3
	Total	144	100.0
Question 9	Yes	110	76.4
	No	34	23.6
	Total	144	100.0
Question 10	Yes	32	22.2
	No	112	77.8
	Total	144	100.0
Question 11	Yes	140	97.2
	No	4	2.8
	Total	144	100.0
Question 12	Yes	107	74.3
	No	37	25.7
	Total	144	100.0
Question 13	Yes	107	74.3
	No	37	25.7
	Total	144	100.0
Question 14	Yes	40	27.8
	No	104	72.2

	Total	144	100.0
Question 15	Yes	54	37.5
	No	90	62.5
	Total	144	100.0
Question 16	Yes	31	21.5
	No	113	78.5
	Total	144	100.0

n, frequency; %, percentages

Appendix 2 - Frequency of consumption of ultra-processed foods.

Table 2. Frequency of consumption of ultra-processed foods in times per week.

Consumption of ultra-processed foods	Mean (SD)	(Minimum-Maximum)
Cold meats and sausages	2.24 (4.06)	(0.00 - 31.50)
Pastry products	2.59 (4.20)	(0.00 - 31.50)
Breakfast cereals	4.62 (9.38)	(0.00 - 42.00)
Cookies and biscuits	6.86 (7.98)	(0.00 - 42.00)
Bread and toasts	3.64 (5.18)	(0.00 - 42.00)
Soft drinks	2.66 (6.30)	(0.00 - 42.00)
Yoghurts	1.89 (4.20)	(0.00 - 42.00)
Flavoured milk	2.59 (6.09)	(0.00 - 42.00)

SD, standard deviation

Appendix 3 – Differences and agreement per question of the AAFV index.

Table 3. Differences and agreement of the AAFV index in the CSQ between applications for secondary school students from one school group in Matosinhos in the school year 2022/2023 (n = 83).

		Test				
		Yes	No	Total		
AAFV	**Retest**	n (%)	n (%)	n (%)	McNemar test	κ (95% CI)
Q1	Yes	35 (42.2)	12 (14.5)	47 (56.6)	0.503	0.516 (0.332-0.700)
	No	8 (9.6)	28 (33.7)	36 (43.4)		
	Total	43 (51.8)	40 (48.2)	83 (100)		
Q2	Yes	80 (96.4)	2 (2.4)	82 (98.8)	1.000	-0.016 (-0.040-0.008)
	No	1 (1.2)	0 (0.0)	1 (1.2)		
	Total	81 (97.6)	2 (2.4)	83 (100)		
Q3	Yes	77 (92.8)	1 (1.2)	78 (94.0)	0.625	0.476 (0.041-0.911)
	No	3 (3.6)	2 (2.4)	5 (6.0)		
	Total	80 (96.4)	3 (3.6)	83 (100)		
Q4	Yes	78 (97.5)	3 (3.6)	81 (97.6)	1.000	-0.030 (-0.057-(-0.003))
	No	2 (2.4)	0 (0.0)	2 (2.4)		

	Total	80 (96.4)	3 (3.6)	83 (100)	
Q5	Yes	69 (83.1)	7 (8.4)	76 (91.6)	0.282 (-0.028-0.592)
	No	4 (4.8)	3 (3.6)	7 (8.4)	0.549
	Total	73 (88.0)	10 (12.0)	83 (100)	
Q6	Yes	42 (50.6)	15 (18.1)	57 (68.7)	0.368 (0.162-0.574)
	No	9 (10.8)	17 (20.5)	26 (31.3)	0.307
	Total	51 (61.4)	32 (38.6)	83 (100)	
Q7	Yes	43 (51.8)	21 (25.3)	64 (77.1)	0.121 (-0.091-0.333)
	No	10 (12.0)	9 (10.8)	19 (22.9)	0.071
	Total	53 (63.9)	30 (36.1)	83 (100)	
Q8	Yes	48 (57.8)	18 (21.7)	66 (79.5)	0.254 (0.040-0.468)
	No	7 (8.4)	10 (12.0)	17 (20.5)	**0.043**
	Total	55 (66.3)	28 (33.7)	83 (100)	

n, frequency; %, percentages; κ Cohen' Kappa coefficient; 95% CI, 95% confidence interval; **p < 0.05**

Appendix 4 – Differences and agreement per question of the CA scale.

Table 4. Differences and agreement of the questions in CA scale in the CSQ between applications for secondary school students from one school group in Matosinhos in the school year 2022/2023. (n = 83).

		Mean (SD)	Wilcoxon test	ICC (95% CI)
Q1	Test	4.10 (0.86)	0.308	0.764 (0.636-0.847)
	Retest	4.00 (0.91)		
Q2	Test	3.87 (0.93)	0.105	0.756 (0.624-0.842)
	Retest	3.72 (0.92)		
Q3	Test	4.14 (0.95)	0.175	0.756 (0.624-0.842)
	Retest	4.01 (1.04)		
Q4	Test	4.14 (0.81)	0.297	0.890 (0.830-0.929)
	Retest	4.08 (0.86)		
Q5	Test	3.54 (0.95)	0.566	0.735 (0.590-0.829)
	Retest	3.49 (0.88)		
Q6	Test	3.99 (0.90)	0.984	0.703 (0.540-0.808)
	Retest	4.00 (0.95)		
Q7	Test	3.80 (0.92)	0.274	0.739 (0.597-0.831)
	Retest	3.70 (0.95)		

SD, standard deviation; ICC, Intraclass correlation coefficient

Appendix 5 – Differences and agreement per question of the CB scale.

Table 5. Differences and agreement of the questions in CB scale in the CSQ between applications for secondary school students from one school group in Matosinhos in the school year 2022/2023. (n = 83).

		Mean (SD)	Wilcoxon test	ICC (95% CI)
Q1	Test	3.11 (1.37)	0.646	0.829

		Mean (SD)	Wilcoxon test	ICC (95% CI)
	Retest	3.14 (1.35)		(0.736-0.890)
Q2	Test	1.95 (0.97)	0.107	0.658 (0.474-0.778)
	Retest	2.13 (0.97)		
Q3	Test	3.59 (1.06)	0.254	0.769 (0.644-0.851)
	Retest	3.47 (1.03)		
Q4	Test	4.43 (1.04)	0.599	0.713 (0.556-0.815)
	Retest	4.37 (1.03)		
Q5	Test	3.76 (0.92)	0.047*	0.729 (0.582-0.825)
	Retest	3.58 (0.93)		
Q6	Test	3.07 (1.24)	0.097	0.660 (0.476-0.779)
	Retest	3.27 (1.14)		
Q7	Test	3.45 (0.44)	0.142	0.674 (0.495-0.789)
	Retest	3.49 (0.46)		
Q8	Test	2.52 (1.37)	0.332	0.658 (0.471-0.779)
	Retest	2.64 (1.18)		
Q9	Test	3.60 (1.02)	0.109	0.745 (0.606-0.835)
	Retest	3.77 (1.00)		
Q10	Test	4.02 (0.66)	0.747	0.737 (0.593-0.830)
	Retest	4.05 (0.78)		

SD, standard deviation; ICC, Intraclass correlation coefficient

Appendix 6 – Differences and agreement per question of the SEPC scale.

Table 6. Differences and agreement of the questions in SEPC scale in the CSQ between applications for secondary school students from one school group in Matosinhos in the school year 2022/2023. (n = 83).

		Mean (SD)	Wilcoxon test	ICC (95% CI)
Q1	Test	3.86 (1.10)	0.923	0.716 (0.560-0.816)
	Retest	3.84 (0.98)		
Q2	Test	3.59 (1.07)	0.371	0.562 (0.322-0.717)
	Retest	3.49 (1.02)		
Q3	Test	3.54 (1.06)	0.307	0.695 (0.530-0.803)
	Retest	3.41 (1.15)		

SD, standard deviation; ICC, Intraclass correlation coefficient

Appendix 7 – Differences and agreement per question of the SEC scale.

Table 7. Differences and agreement of the questions in SEC scale in the CSQ between applications for secondary school students from one school group in Matosinhos in the school year 2022/2023. (n = 83).

		Mean (SD)	Wilcoxon test	ICC (95% CI)
Q1	Test	3.78 (1.12)	0.597	0.750 (0.614-0.838)
	Retest	3.87 (1.07)		
Q2	Test	3.93 (1.02)	0.511	0.713

		Mean (SD)	Wilcoxon test	ICC (95% CI)
	Retest	3.98 (1.04)		(0.556-0.815)
Q3	Test	4.00 (0.92)	0.091	0.754 (0.621-0.841)
	Retest	3.83 (1.01)		
Q4	Test	4.14 (0.99)	0.825	0.768 (0.641-0.850)
	Retest	4.14 (0.87)		
Q5	Test	3.77 (0.94)	0.400	0.871 (0.801-0.917)
	Retest	3.71 (0.98)		
Q6	Test	3.86 (1.00)	0.537	0.856 (0.777-0.907)
	Retest	3.81 (0.96)		

SD, standard deviation; ICC, Intraclass correlation coefficient

Appendix 8 – Differences and agreement per question of the SECT scale.

Table 8. Differences and agreement of the questions in SECT scale in the CSQ between applications for secondary school students from one school group in Matosinhos in the school year 2022/2023. (n = 83).

		Mean (SD)	Wilcoxon test	ICC (95% CI)
Q1	Test	4.27 (1.01)	0.089	0.836 (0.746-0.894)
	Retest	4.12 (1.01)		
Q2	Test	3.92 (1.08)	0.965	0.725 (0.575-0.823)
	Retest	3.94 (0.98)		
Q3	Test	3.42 (1.18)	0.707	0.708 (0.548-0.811)
	Retest	3.39 (1.15)		
Q4	Test	3.17 (1.26)	0.057	0.768 (0.642-0.850)
	Retest	2.98 (1.21)		
Q5	Test	3.66 (1.17)	0.491	0.700 (0.536-0.806)
	Retest	3.73 (1.12)		
Q6	Test	3.67 (1.21)	0.447	0.730 (0.582-0.825)
	Retest	3.58 (1.17)		
Q7	Test	4.05 (1.08)	0.971	0.779 (0.657-0.857)
	Retest	4.05 (1.08)		
Q8	Test	3.22 (1.24)	0.119	0.786 (0.670-0.861)
	Retest	3.39 (1.18)		
Q9	Test	3.89 (1.15)	0.954	0.846 (0.761-0.900)
	Retest	3.88 (1.16)		
Q10	Test	3.73 (1.18)	0.899	0.877 (0.810-0.921)
	Retest	3.73 (1.17)		
Q11	Test	2.78 (1.15)	0.185	0.783 (0.665-0.859)
	Retest	2.93 (1.11)		
Q12	Test	4.27 (1.08)	0.483	0.710 (0.552-0.813)
	Retest	4.31 (1.07)		

SD, standard deviation; ICC, Intraclass correlation coefficient

Appendix 9 – Differences and agreement per question of the SEFVS scale.

Table 9. Differences and agreement of the questions in SEFVS scale in the CSQ between applications for secondary school students from one school group in Matosinhos in the school year 2022/2023. (n = 83).

		Mean (SD)	Wilcoxon test	ICC (95% CI)
Q1	Test	3.46 (1.05)	0.162	0.733 (0.588-0.827)
	Retest	3.58 (1.14)		
Q2	Test	3.60 (1.09)	0.133	0.812 (0.711-0.879)
	Retest	3.73 (1.06)		
Q3	Test	4.25 (0.97)	0.710	0.782 (0.663-0.859)
	Retest	4.20 (0.97)		
Q4	Test	3.53 (1.13)	0.926	0.811 (0.707-0.878)
	Retest	3.51 (1.08)		
Q5	Test	3.69 (1.06)	0.258	0.773 (0.649-0.853)
	Retest	3.57 (1.07)		
Q6	Test	3.24 (1.15)	0.691	0.706 (0.544-0.810)
	Retest	3.29 (1.15)		
Q7	Test	3.84 (1.10)	0.021*	0.635 (0.437-0.763)
	Retest	3.55 (1.10)		
Q8	Test	2.90 (1.26)	0.554	0.831 (0.739-0.891)
	Retest	2.96 (1.28)		

SD, standard deviation; ICC, Intraclass correlation coefficient

Appendix 10 – Differences and agreement per question of the Knowledge section.

Table 10. Differences and agreement of the questions in Knowledge section in the CSQ between applications for secondary school students from one school group in Matosinhos in the school year 2022/2023. (n = 83).

		Test				
		Right	Wrong	Total		
	Retest	n (%)	n (%)	n (%)	McNemar test (P)	κ (95% CI)
Q1	Right	31 (37.3)	14 (16.9)	45 (54.2)	0.189	0.498 (0.314-0.682)
	Wrong	7 (8.4)	31 (37.3)	38 (45.8)		
	Total	38 (45.8)	45 (54.2)	83 (100.0)		
Q2	Right	53 (63.9)	9 (10.8)	62 (74.7)	0.607	0.543 (0.341-0.745)
	Wrong	6 (7.2)	15 (18.1)	21 (25.3)		
	Total	59 (71.1)	24 (28.9)	83 (100.0)		
Q3	Right	28 (33.7)	14 (16.9)	42 (50.6)	0.064	0.543 (0.367-0.719)
	Wrong	5 (6.0)	36 (43.4)	41 (49.4)		
	Total	33 (39.8)	50 (60.2)	83 (100.0)		
Q4	Right	7 (8.4)	5 (6.0)	12 (14.5)	0.219	0.661 (0.412-0.910)
	Wrong	1 (1.2)	70 (84.3)	71 (85.5)		
	Total	8 (9.6)	75 (90.4)	83 (100.0)		
Q5	Right	37 (44.6)	9 (10.8)	46 (55.4)	0.523	0.458

	Wrong	13 (15.7)	24 (28.9)	37 (44.6)		(0.266-0.650)
	Total	50 (60.2)	33 (39.8)	83 (100.0)		
Q6	Right	68 (81.9)	3 (3.6)	71 (85.5)	0.227	0.352 (0.056-0.648)
	Wrong	8 (9.6)	4 (4.8)	12 (85.5)		
	Total	76 (91.6)	7 (8.4)	83 (100.0)		
Q7	Right	48 (57.8)	8 (9.6)	58 (69.9)	0.815	0.496 (0.294-0.698)
	Wrong	10 (12.0)	17 (20.5)	25 (30.1)		
	Total	56 (67.5)	27 (32.5)	83 (100.0)		
Q8	Right	28 (33.7)	7 (8.4)	35 (42.2)	1.000	0.654 (0.489-0.819)
	Wrong	7 (8.4)	41 (49.4)	48 (57.8)		
	Total	35 (42.2)	48 (57.8)	83 (100.0)		

n, frequency; %, percentages; κ Cohen' Kappa coefficient; 95% CI, 95% confidence interval

General conclusions and future research

To our best knowledge, this is the first study to cross-culturally adapt and validate a questionnaire for assessing cooking skills in Portugal. Once this questionnaire proven to have adequate reproducibility and validity, it can be an important tool for developing and implementing intervention projects with Portuguese adolescents. The fact that the questionnaire is comprehensive, measuring various constructs associated with cooking skills, will allow a detailed needs assessment to be carried out and the project to be adapted to what is observed in the target population.

There are already various interventions in school context that show promising results. (56-58) Despite the understanding that Portuguese adolescents lack cooking skills, (59-61) the implementation of such interventions in Portugal is still scarce. (62)

Teenagers are at a key stage in the development of various competences, including cooking skills. As they spend a large part of their day at school, this is the ideal place to implement interventions aimed at developing these skills, as recommended by the World Health Organization. (59, 63, 64)

Like other competences, the development of cooking skills benefits from longer-term programmes to ensure greater effectiveness. (63, 65)

When deciding which interventions to implement, it should be considered that in addition to knowledge, adolescents need to be given space to experiment with preparing and cooking different foods, allowing them to develop their self-efficacy. (63, 66)

Also, involving digital native teens in the acquisition of these skills necessitates novel techniques of capturing their attention, including the use of technology.

There are several unique programs in this category, such as a game that allows users to create meals in a virtual kitchen, allowing them to try their hand at something they probably wouldn't be able to do in real life. (67, 68)

Finally, when designing the projects, it is essential to define process and outcome evaluation, not only to ensure that the objectives are met and that the intervention is effective, but also to increase knowledge in this area, which is still scarce, and to reinforce the importance of developing cooking skills.

Furthermore, future research should focus on better exploring relationship of cooking skills with other socio-demographic and lifestyle variables. One very interesting analysis might be the association between parents and adolescents cooking skills, exploring the observed change in the transmission of such abilities. The knowledge of these determinant factors will be of utmost relevance for project planning and implementation.

References

1.   World Health Organization. World health statistics 2022: monitoring health for the SDGs, sustainable development goals. Global report [Internet]. Europe: WHO, [cited 2023 August 18]. Available from: https://apps.who.int/iris/handle/10665/356584.

2.   Ministério da Saúde. Retrato da Saúde. Portugal. 2018.

3.   Vos T, Lim SS, Abbafati C, Abbas KM, Abbasi M, Abbasifard M, et al. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet. 2020;396(10258):1204-22.

4.   Gregório MJ, Bica M, Salvador C, Sousa SM, Teixeira D. Programa Nacional para a Promoção da Alimentação Saudável. Lisboa: Direção-Geral da Saúde; 2021.

5.   Prentice AM, Jebb SA. Obesity in Britain: gluttony or sloth? Bmj. 1995;311(7002):437-9.

6.   Samaras K, Kelly PJ, Chiano MN, Spector TD, Campbell LV. Genetic and environmental influences on total-body and central abdominal fat: the effect of physical activity in female twins. Annals of Internal Medicine. 1999;130(11):873-82.

7.   World Health Organization. WHO European Regional Obesity Report 2022. Copenhagen: WHO Regional Office for Europe. 2022.

8.   Thakur S, Mathur P. Nutrition knowledge and its relation with dietary behaviour in children and adolescents: a systematic review. Int J Adolesc Med Health. 2021;15:192.

9.   Ministério da Saúde, Direção-Geral da Saúde. Programa Nacional para a Promoção da Alimentação Saudável 2022-2030 [Internet]. [cited 2023 May 20]. Available from: https://nutrimento.pt/activeapp/wp-content/uploads/2022/10/PNPAS2022_2030_VF.pdf

10.   Graça P, Gregório MJ, de Sousa SM, Brás S, Penedo T, Carvalho T, et al. A new interministerial strategy for the promotion of healthy eating in Portugal: implementation and initial results. Health research policy and systems. 2018;16(1):1-16.

11.   Utter J, Fay AP, Denny S. Child and youth cooking programs: more than good nutrition? Journal of Hunger & Environmental Nutrition. 2017;12(4):554-80.

12.   Jomori M, Vasconcelos F, Bernardo L, Uggioni P, Proença R. The concept of cooking skills: A review with contributions to the scientific debate. Revista de Nutrição. 2018;31:119-35.

13.   World Health Organization. European food and nutrition action plan 2015–2020. Copenhagen: Regional Committee for Europe. 2015.

14.   McGowan L, Pot GK, Stephen AM, Lavelle F, Spence M, Raats M, et al. The influence of socio-demographic, psychological and knowledge-related variables alongside perceived cooking and food skills abilities in the prediction of diet quality in adults: a nationally representative cross-sectional study. International Journal of Behavioral Nutrition and Physical Activity. 2016;13(1):1-13.

15.   Wolfson JA, Bleich SN. Is cooking at home associated with better diet quality or weight-loss intention? Public health nutrition. 2015;18(8):1397-406.

16.   Chen RC-Y, Lee M-S, Chang Y-H, Wahlqvist ML. Cooking frequency may enhance survival in Taiwanese elderly. Public health nutrition. 2012;15(7):1142-9.

17.   Van der Horst K, Brunner TA, Siegrist M. Ready-meal consumption: associations with weight status and cooking skills. Public health nutrition. 2011;14(2):239-45.

18.   Lavelle F, Benson T, Hollywood L, Surgenor D, McCloat A, Mooney E, et al. Modern transference of domestic cooking skills. Nutrients. 2019;11(4):870.

19.   Kellett M, Forrest R, Dent N, Ward S. 'Just teach us the skills please, we'll do the rest': empowering ten-year-olds as active researchers. Children & Society. 2004;18(5):329-43.

20.   Lavelle F, Spence M, Hollywood L, McGowan L, Surgenor D, McCloat A, et al. Learning cooking skills at different ages: a cross-sectional study. International Journal of Behavioral Nutrition and Physical Activity. 2016;13(1):1-11.

21.   Saxe-Custack A, Egan S, Sadler R, Wojciechowski T. Relative impacts of a virtual cooking and nutrition program for children and families. Appetite. 2023:107041.

22.   Lopes C, Torres D, Oliveira A, Severo M, Alarcão V, Guiomar S, et al. Inquérito Alimentar Nacional e de Atividade Física IAN-AF 2015-2016: relatório de resultados. Universidade do Porto: Lisbon, Portugal. 2017.

23.   European Commission. EU Action Plan on Childhood Obesity 2014–2020. European Commission Brussels, Belgium; 2014.

24.   Direção Geral do Ensino Superior. Sobre o PNAES (Plano Nacional de Alojamento para o Ensino Superior) [Internet]. [cited 2023 July 3]. Available from: https://pnaes.pt/sobre-o-pnaes/

25.   Stok FM, Renner B, Clarys P, Lien N, Lakerveld J, Deliens T. Understanding eating behavior during the transition from adolescence to young adulthood: a literature review and perspective on future research directions. Nutrients. 2018;10(6):667.

26.   Leal F, Oliveira B, Rodrigues S. Relationship between cooking habits and skills and Mediterranean diet in a sample of Portuguese adolescents. Perspectives in Public Health. 2011;131(6):283-7.

27.   Romero-Robles MA, Ccami-Bernal F, Ortiz-Benique ZN, Pinto-Ruiz DF, Benites-Zapata VA, Patiño D. Adherence to Mediterranean diet associated with health-related quality of life in children and adolescents: a systematic review. BMC nutrition. 2022;8(1):1-17.

28.   Utter J, Larson N, Laska MN, Winkler M, Neumark-Sztainer D. Self-perceived cooking skills in emerging adulthood predict better dietary behaviors and intake 10 years later: a longitudinal study. Journal of nutrition education and behavior. 2018;50(5):494-500.

29.   Caraher M, Dixon P, Lang T, Carr-Hill R. The state of cooking in England: the relationship of cooking skills to food choice. British food journal. 1999.

30.   Engler-Stringer R. Food, cooking skills, and health: a literature review. Canadian journal of Dietetic practice and research. 2010;71(3):141-5.

31.   Beck M. Dinner preparation in the modern United States. British Food Journal. 2007.

32.   Worsley T, Wang WC, Wijeratne P, Ismail S, Ridley S. Who cooks from scratch and how do they prepare food? British Food Journal. 2015;117(2):664-76.

33.   Soliah LAL, Walter JM, Jones SA. Benefits and barriers to healthful eating: what are the consequences of decreased food preparation ability? American Journal of Lifestyle Medicine. 2012;6(2):152-8.

34.   Martins GO, Gomes CAS, Brocardo J, Pedroso JV, Camilo JLA, Silva LMU, et al. Perfil dos alunos à saída da escolaridade obrigatória. Ministério da Educação, Direção-Geral da Educação; 2017.

35.   Zhou W-j, Xu X-l, Li G, Sharma M, Qie Y-L, Zhao Y. Effectiveness of a school-based nutrition and food safety education program among primary and junior high school students in Chongqing, China. Global Health Promotion. 2016;23(1):37-49.

36.   O'Connor-Fleming ML, Parker E, Higgins H, Gould T. A framework for evaluating health promotion programs. Health Promotion Journal of Australia. 2006;17(1):61-6.

37.   Jackson R. The short-term effects of the COOK intervention on cooking skills and self-efficacy for cooking in New Zealand adolescents: University of Otago; 2018.

38.   Price TT, Carrington A-CS, Margheim L, Serrano E. Teen Cuisine: impacting dietary habits and food preparation skills in adolescents. Journal of Nutrition Education and Behavior. 2017;49(2):175-8. e1.

39.   Guillemin F, Bombardier C, Beaton D. Cross-cultural adaptation of health-related quality of life measures: literature review and proposed guidelines. Journal of clinical epidemiology. 1993;46(12):1417-32.

40.   Eremenco SL, Cella D, Arnold BJ. A comprehensive method for the translation and cross-cultural validation of health status questionnaires. Evaluation & the health professions. 2005;28(2):212-32.

41.   Borsa JC, Damásio BF, Bandeira DR. Adaptação e validação de instrumentos psicológicos entre culturas: algumas considerações. Paidéia (Ribeirão Preto). 2012;22:423-32.

42.   Jomori MM. Adaptação transcultural e validação de um instrumento de identificação das habilidades culinárias e alimentação saudável em estudantes ingressantes de uma universidade brasileira: Universidade Federal de Santa Catarina; 2017.

43.   Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine. 2000;25(24):3186-91.

44.   Cunningham-Sabo L, Lohse B. Impact of a school-based cooking curriculum for fourth-grade students on attitudes and behaviors is influenced by gender and prior cooking experience. Journal of nutrition education and behavior. 2014;46(2):110-20.

45.   Dean M, Issartel J, Benson T, McCloat A, Mooney E, McKernan C, et al. CooC11 and CooC7: the development and validation of age appropriate children's perceived cooking competence measures. International Journal of Behavioral Nutrition and Physical Activity. 2021;18(1):1-12.

46.   Barton KL, Wrieden W, Anderson A. Validity and reliability of a short questionnaire for assessing the impact of cooking skills interventions. Journal of Human Nutrition and Dietetics. 2011;24(6):588-95.

47.   Condrasky MD, Williams JE, Catalano PM, Griffin SF. Development of psychosocial scales for evaluating the impact of a culinary nutrition education program on cooking and healthful eating. Journal of nutrition education and behavior. 2011;43(6):511-6.

48. Lavelle F, McGowan L, Hollywood L, Surgenor D, McCloat A, Mooney E, et al. The development and validation of measures to assess cooking skills and food skills. International Journal of Behavioral Nutrition and Physical Activity. 2017;14(1):1-13.

49. Warmin A, Sharp J, Condrasky MD. Cooking with a chef: A culinary nutrition program for college aged students. Topics in Clinical Nutrition. 2012;27(2):164-73.

50. Kowalkowska J, Poínhos R, Rodrigues S. Cooking skills and socio-demographics among Portuguese university students. British Food Journal. 2018;120(3):563-77.

51. Costa V, Borrego R, Mateus C, Carolino E, Viegas C. Assessment of food and cooking skills: validation of a Portuguese version of a tool and characterisation of food and cooking skills in young adults. Portuguese Journal of Public Health. 2023:1-11.

52. Michaud P. Development and evaluation of instruments to measure the effectiveness of a culinary and nutrition education program [Master Thesis]: Clemson University; 2007.

53. Kerrison D, Condrasky MD, Sharp JL. Culinary nutrition education for undergraduate nutrition dietetics students. British Food Journal. 2017;119(5):1045-51.

54. Kerrison D. Pilot study of a budget-tailored culinary nutrition education program for undergraduate food science students [Master Thesis]: Clemson University; 2014.

55. Warmin A. Cooking with a chef: A culinary nutrition intervention for college aged students [Master Thesis]: Clemson University; 2009.

56. Seeley A, Wu M, Caraher M. Should we teach cooking in schools? A systematic review of the literature of school-based cooking interventions. Journal of the Home Economics Institute of Australia. 2010;17(1):10-8.

57. Bennett AE, Mockler D, Cunningham C, Glennon-Slattery C, Johnston Molloy C. A review of experiential school-based culinary interventions for 5–12-year-old children. Children. 2021;8(12):1080.

58. Ares G, De Rosso S, Mueller C, Philippe K, Pickard A, Nicklaus S, et al. Development of food literacy in children and adolescents: implications for the design of strategies to promote healthier and more sustainable diets. Nutrition Reviews. 2023:nuad072.

59. Mendes S, Rito A, Figueira I. Improving adolescents' cooking skills and food literacy in Portugal: a youth-led policy idea as a lifelong health-promoting strategy. The CO-Create European Project. Population Medicine. 2023;5(Supplement).

60. Syeda R, Touboul Lundgren P, Kasza G, Truninger M, Brown C, Lacroix-Hugues V, et al. Young people's views on food hygiene and food safety: A multicentre qualitative study. Education Sciences. 2021;11(6):261.

61. Leal F, Oliveira B, Rodrigues S. Cooking skills and learning sources in a sample of Portuguese adolescents. Culinary Arts and Sciences VII. 2011:313.

62. Turismo de Portugal. New Plant Based Cooking Program now available in the Turismo de Portugal Schools of Lisbon and Porto [Internet]. Turismo de Portugal 2022, [cited 2023 August 31]. Available from: https://www.turismodeportugal.pt/en/Noticias/Pages/curso-executivo-cozinha-pastelaria-base-vegetal.aspx.

63.   Brooks N, Begley A. Adolescent food literacy programmes: A review of the literature. Nutrition & Dietetics. 2014;71(3):158-71.

64.   World Health Organization. Food and nutrition policy for schools: a tool for the development of school nutrition programmes in the European Region. 2006.

65.   Hoelscher DM, Evans A, Parcel G, Kelder S. Designing effective nutrition interventions for adolescents. Journal of the American Dietetic Association. 2002;102(3):S52-S63.

66.   Beets MW, Swanger K, Wilcox DR, Cardinal BJ. Using hands-on demonstrations to promote cooking behaviors with young adolescents: the culinary camp summer cooking program. Journal of Nutrition Education and Behavior. 2007;39(5):288-9.

67.   Wickham CA, Carbone ET. What's technology cooking up? A systematic review of the use of technology in adolescent food literacy programs. Appetite. 2018;125:333-44.

68.   Baranowski T, Baranowski J, Cullen KW, Marsh T, Islam N, Zakeri I, et al. Squire's Quest!: Dietary outcome evaluation of a multimedia game. American journal of preventive medicine. 2003;24(1):52-61.

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