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Cooking and food skills confidence of team sport athletes in Ireland

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Abstract

Nutritional support often focuses on cooking and food skills such as food selection, recipe planning and meal preparation. Individuals with greater cooking and food skills confidence have previously displayed higher diet quality scores and lower intakes of overall calories, saturated fat and sugar. Despite this, the cooking and food skills of team sport athletes have yet to be investigated. This study aimed to evaluate the relationship between cooking and food skills confidence and athletes' demographic characteristics. A validated measure for the assessment of cooking and food skills confidence was distributed via an online survey. Participants were required to rate their confidence on a Likert scale (1 "very poor" – 7 "very good") for 14 items related to cooking skills and 19 items for food skills. Food engagement, general health interest and self-reported fruit and vegetable consumption as a measure of diet quality were also measured. The survey was completed by 266 team sport athletes (male: 150, female: 116, age: 24.8 ± 6.1 years). Group differences were explored using t-tests and ANOVA and associations were evaluated using Spearman's correlation and hierarchical multiple regressions. Athletes' total cooking and food skills confidence was 62.7 ± 17.4 (64.0 ± 17.8%) and 83.8 ± 20.1 (63.0 ± 15.1%), respectively. Females reported greater confidence in both cooking (+20.3%, $p < 0.01$) and food skills (+9.2%, $p < 0.01$). Hierarchical multiple regressions explained 48.8% of the variance in cooking skills confidence and 44% of the variance in food skills confidence with gender, previous culinary training, cooking learning stage, general health interest and food engagement all remaining significant in the cooking skills confidence model and cooking frequency, previous culinary training, general health interest and food engagement remaining significant in the food skills confidence model. Male team sport athletes may benefit the most from educational interventions designed to increase cooking and food skills confidence.

KEYWORDS
confidence, cooking, diet quality, food skills, sports nutrition, team sport

INTRODUCTION

Optimal nutritional intake is essential for maximising athletic performance (Rodriguez et al., 2009). Despite this, team sport athletes' diets have repeatedly been identified as inadequate, demonstrating insufficient energy intake to support training (Jenner et al., 2018) and competition (Tooley et al., 2015), consistent failure to meet carbohydrate recommendations (Anderson et al., 2017; Bradley et al., 2015; Ó Catháin et al., 2020) and excessive consumption of protein and fat (Devlin et al., 2017; Raizel et al., 2017). These dietary patterns may subsequently compromise adaptation and recovery from training, whilst also preventing acute optimisation

of performance through appropriate fuelling strategies (Maughhan & Shirreffs, 2011; Thomas et al., 2016). It is also important to acknowledge that standardised techniques to measure energy intake in free-living athletes are yet to be determined, and all techniques are subject to a degree of error (Burke et al., 2018). This may also partly explain why athletes consistently fail to meet dietary recommendations. Multiple factors are thought to influence dietary intake such as food preference, attitude towards nutrition, nutrition knowledge and food management skills such as purchasing and preparing food (Birkenhead & Slater, 2015; Heaney et al., 2011).

Team sport athletes have previously displayed poor declarative nutrition knowledge (Renard et al., 2020; Renard, Anton-Solanas, et al., 2021), although this overlooks the fact that nutritional support may focus more on aspects of procedural knowledge, such as food selection, recipe planning and meal preparation skills (Trakman et al., 2019). A lack of adequate cooking and food skills can be an inhibiting factor for the achievement of optimal nutrition practices in athletes (Burke, 1995; Carter et al., 2022) and may negatively influence the dietary intake of athletes (Birkenhead & Slater, 2015; Heaney et al., 2008). Recently, an academy football player's ability to cook was identified as an important component of the player's capability to elicit positive behavioural change concerning their diet (Carter et al., 2022).

Cooking skills can be broadly defined as the physical and mechanical skills used during the production of a meal, encompassing both cooking methods and preparation techniques (Short, 2003). Food skills can be defined as the skills required to select and prepare food for nutritionally balanced and satisfying meals and may include meal planning, food shopping, budgeting and label reading (Porter et al., 2000). In the general population, greater food skills have been associated with positive cooking behaviours, enhanced dietary intake, improved dietary quality and better weight control (Lavelle et al., 2020; McGowan et al., 2016; Wolfson et al., 2020; Wolfson & Bleich, 2015). Cooking more frequently at home (6–7 times/week) compared to less frequently (0–1 times/week) has previously been associated with significantly lower daily consumption of energy (9054 vs. 9627 kJ), fat (81 vs. 86 g) and sugar (119 vs. 135 g) (Wolfson & Bleich, 2015). Such a difference may partially be explained by the possibility that individuals who cook less may also eat out more frequently, although this was not reported by the study and further investigation is required.

Currently, there is limited evidence assessing the potential influence of cooking and food skills on an athlete's dietary intake. This is an essential factor for consideration, since athletes are more likely to have larger energy intakes and a greater frequency of meal consumption (Burke et al., 2003), meaning the magnitude of beneficial effects observed in the general population may be amplified. A previous intervention in student-athletes that utilised a total of four social cognitive-based cooking workshops over 4 weeks lead to significant improvements in self-efficacy for food selection and food preparation (Ellis et al., 2018). Whether such an improvement leads to quantifiable improvements in dietary intake remains unknown, although improvements in self-efficacy for such behaviours have previously been linked to greater compliance with nutritional recommendations among football players (Gacek, 2015).

A majority of team sports are characterised by intermittent high-intensity activity, followed by periods of low-to-moderate active recovery or passive rest (Holway & Spriet, 2011; Mujika & Burke, 2010). These demands are variable depending on the rules of each sport, the duration and frequency of matches, as well as position-specific tasks and the level of competition (Holway & Spriet, 2011). To adequately support such physiological demands, team sport athletes have unique nutritional needs which are distinct from the requirements of other individual sports and the wider general population (Williams & Rollo, 2015). Team sport athletes have previously displayed dietary intakes that fail to meet recommendations (Renard, Kelly, et al., 2021) as well as poor levels of nutrition knowledge (Renard et al., 2020; Renard, Anton-Solanas, et al., 2021). This highlights a need for further research exploring factors that might contribute to dietary intake specifically in team sport athletes. The assessment of cooking and food skills confidence in team sport athletes may highlight the need for future interventions that could offer a potential mechanism for the improvement of dietary practices. It is also important to consider that several sociodemographic factors including age, gender, household income and highest level of education have been identified to influence both cooking and food skills confidence (Adams et al., 2015; Lavelle et al., 2017; McGowan et al., 2016; Mills et al., 2018; Murphy et al., 2020). Comparisons of team sport athletes' cooking and food skills confidence based on factors such as age, gender and highest level of education would better inform the design and stratification of future interventions. Considering the above factors, this research study aimed to evaluate the cooking and food skills confidence of team sport athletes and to explore the relationship between cooking/food skills confidence and athletes' demographic characteristics.

METHODS

Ethics statement

The study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the ethics review board at the Technological University of the Shannon, Ireland (Approval code: 20210403). Informed consent was obtained from all subjects before participating in the study.

Participants

Data collection was conducted between April 2021 and May 2022. Participants were required to be over the age of 18 years, domiciled in Ireland and currently participating in/training for a team sport at least twice per week. Participants were also required to be responsible for preparing a main meal at least once a week. A 'main meal' was defined as the biggest or most substantial meal of the day eaten at home. 'Cooking' was defined as anything you do to food to make it ready to eat, which could mean cooking it from scratch, reheating a ready meal or preparing something cold (Lavelle et al., 2017).

Study design

A cross-sectional study that collected data via an online questionnaire using Survey Monkey (Momentive Global Inc) was performed. A URL link to the online survey was disseminated via social media (Twitter, Instagram). Team managers, governing bodies and individuals were also approached directly for wider dissemination and completion of the survey. A representative sample was aimed for via these means although no form of probability sampling was used. The questionnaire included measures for cooking and food skills confidence (Lavelle et al., 2017), food engagement (O'Kane et al., 2022) and general health interest (Roininen et al., 1999). The average completion time was 15 min.

Sociodemographic information

Sociodemographic information was gathered including age, gender, country of residence, highest level of education, current occupation status, primary team sport, competitive level, years participating in primary sport, average training hours per week, self-reported mass (kg) and stature (cm), specific dietary requirements and whether they have engaged in any formal cooking/culinary training previously. Additionally, the frequency per week of cooking a main meal was assessed.

Cooking and food skills

Validated measures for the assessment of self-reported cooking and food skills confidence (Lavelle et al., 2017) were included. The cooking skills confidence measure consisted of a list of 14 cooking skills whereby participants were asked the following: "On a scale of 1 to 7 where 1 means very poor and 7 means very good, please say how good you are at…". Examples included peeling and chopping vegetables, blending food, stewing food and baking. The food skills confidence measure asked the same as above but for a list of 19 food skills including examples such as meal planning, preparing meals in advance, shopping with a grocery list and following recipes (Lavelle et al., 2017; McGowan et al., 2016). A confidence score was established by summing the 1–7 ratings for all the skills that were presented. This was repeated for both the cooking and food skills measured. The maximum score achievable for cooking skills was 98 and for food skills was 133. A higher score in each represents a higher number of total skills used and/or a higher level of confidence (Lavelle, Spence, et al., 2016; Lavelle et al., 2017). The substantial internal consistency reliability, construct and convergent validity and temporal stability of the measures have been reported previously (Lavelle et al., 2017).

Cooking and food skill development

The stage of life the participant learnt most of their cooking skills and where from/whom they learnt most of their cooking skills was determined with a set of questions used by a previous investigation (Lavelle, Spence, et al., 2016).

Food engagement

Food engagement, which is defined as "actively performing food-related behaviours along the food chain" (O'Kane et al., 2022), was additionally assessed. Ten questions were used from a validated food chain engagement scale (O'Kane et al., 2022). Participants were asked the following: "On a scale of 1 to 5, with 1 meaning 'never,' and 5 meaning 'always,' how often do you…". Examples included buy fresh food to cook from scratch, prepare meals for yourself and others, read about food and watch any food-related media? A food engagement score was established by summing the 1–5 ratings, with a higher score representing a greater level of food engagement. The maximum score achievable was 50.

General health interest

General health interest related to diet was assessed using 10 questions derived from the health and taste attitude scales (Roininen et al., 1999). Participants were asked the following: "To what extent do you agree or disagree with each of the following statements? Please use a scale of 1 to 7, where 1 means strongly disagree and 7 means strongly agree". Examples included: "the healthiness of food has little impact on my food choices", "it is important for me that my diet is low in fat" and "what I eat has a major impact on my personal

health". A general health interest score was established by summing the 1–7 ratings, with a higher score representing a greater level of general health interest. The maximum score achievable was 70.

Diet quality

To assess fruit and vegetable consumption (as indicators of diet quality and fibre intake), a question from the Dietary Instrument for Nutrition Education (DINE) validated tool (Roe et al., 1994) was included. This was conducted in the same manner as Murphy et al. (2020) who asked participants to report the number of portions of fruit/vegetables they consumed per day, whilst also providing examples of what was considered a portion. Participants were asked, "how many servings or portions per day do you eat of the following foods?". Options included "Vegetables (fresh/frozen/canned, excluding juice)" and "Fruit (fresh/frozen/canned/dried, excluding juice). A portion was defined by the adult standard serving size of 80 g. For example, one medium-sized fruit (apple, orange, banana) or a half cup of cooked vegetables.

Statistical analyses

Statistical analysis was performed using Jamovi (Version 1.6) and R Core Package (Version 4.0). Data are reported as mean and standard deviations (±) with Alpha set at $p < 0.05$ for all tests. Outliers were assessed by inspection of a box plot. The normality of test scores was assessed using Shapiro–Wilk test, and the homogeneity of variances using Levene's test. Differences in cooking/food skills confidence, food engagement, general health interest and dietary intake measures between factors of gender, cooking frequency, previous culinary training, cooking learning stage and education level were assessed using t-test and/or ANOVA for parametric data, and/or Mann–Whitney U-test and Kruskal–Wallis for non-parametric data. Post-hoc analysis was performed using Tukey's post-hoc test. Bivariate correlations using Pearson's correlation coefficients/Spearman's correlation were also used to examine any associations between sociodemographic variables, cooking/food skills confidence, food engagement, general health interest and measures of diet quality. Hierarchical multiple regression analyses were conducted using the cooking skills confidence and food skills confidence scores as outcome (criterion) variables. Sociodemographic variables (age, gender, education level) were inputted first followed by cooking and food variables (cooking frequency, previous culinary training, cooking learning stage) and then psychological variables (general health interest, food engagement score). Assumptions of independence of residuals, collective linear relationship to the dependent variable, homoscedasticity, multicollinearity, high leverage/influential points and normal distribution were assessed. Effect size was reported as either Cohen's d, and interpreted as small (d = 0.2), medium (d = 0.5) and large (d = 0.8) or as Eta-squared (n^2), and interpreted as small ($n^2 = 0.010$), medium ($n^2 = 0.060$) and large ($n^2 = 0.140$) (Cohen, 1988).

RESULTS

Participants

The URL link for the survey was accessed by 770 participants, of which 42% ($n = 322$) completed the questionnaire. Partial responses were not accepted and forced completion of all items was applied, requiring the participant to complete all questions before being able to submit the survey. Of the 322 respondents, 20 were excluded for failure to meet the inclusion criteria of being responsible for cooking at least one main meal a week. Further participants were excluded as they did not participate in a team sport ($n = 15$), were not above the age of 18 years old ($n = 12$) or were not currently domiciled in Ireland ($n = 9$). The final sample consisted of 266 (male: 150, female: 116, age: 24.8 ± 6.1 years) team sport athletes, for participant characteristics, see Table 1.

The competitive level of the sample ranged from recreational ($n = 20$, 7.5%) to club/sub-elite ($n = 175$, 65.8%) to national/elite ($n = 71$, 26.7%). Most participants were either in full-time work (42.1%) or full-time higher education (39.5%). A majority of the sample (94%) reported no dietary restrictions, and the other 6% ($n = 16$) of the sample reported dietary restrictions that included: gluten-free ($n = 5$), vegetarian ($n = 4$), low carbohydrate ($n = 3$), pescatarian ($n = 1$), vegan ($n = 1$) and low FODMAP ($n = 1$). A majority of the sample (93.2%) reported having no previous formal culinary training, whereas 6.8% ($n = 18$) declared previous culinary training ranging from home economics classes at school/college ($n = 12$) to private cooking courses ($n = 4$) and work as a kitchen assistant/chef

TABLE 1 Participant characteristics.

Variable	Male ($n = 150$)	Female ($n = 116$)
Age (years)	26 ± 6.5	23.3 ± 5.3
Mass (kg)	86.6 ± 15.0	65.7 ± 9.9
Stature (cm)	181 ± 8	166 ± 9
BMI (kg/m^2)	26.6 ± 4.4	23.8 ± 3.6
Training (hours/week)	7.5 ± 3.7	7.1 ± 3.3
Training (years)	15.8 ± 7.4	13.1 ± 6.7

($n=2$). Details of the sample's sport, education level, cooking frequency and cooking learning stage are displayed in Table 2.

TABLE 2 Sport, education level, cooking frequency and learning stage.

Variable	*n*	%
Sport		
Gaelic football	135	50.8
Soccer	50	18.8
Rugby	50	18.8
Camogie	12	4.5
Hurling	9	3.4
Hockey	4	1.5
Basketball	3	1.1
Volleyball	2	0.8
American football	1	0.4
Highest level of education		
Junior certificate (Secondary School to age 15/16 years)	1	0.4
Leaving certificate (Senior Secondary School to age 17/18 years)	96	36.1
Additional training (e.g. NVQ, BTEC, FETAC, FAS, VET)	25	9.4
Undergraduate degree	101	38.0
Postgraduate degree	43	16.2
Cooking frequency		
1–2 times per week	70	26.3
3–4 times per week	86	32.3
5–6 times per week	44	16.5
Everyday	66	24.8
Learning stage		
Under 12 years old	14	5.3
13–17 years old	129	48.5
18+ years old	123	46.2

Cooking skills

Participants' mean cooking skill confidence was 62.7 ± 17.4 out of a possible 98 (64.0 ± 17.8%). Median scores for each of the 14 items are displayed in Figure 1 below.

Total cooking skills confidence was significantly higher in those that reported previous culinary training (71.5 ± 16.5) compared to those that did not (62.1 ± 17.3), (9.41, 14.1%, 95% CI, 1.11–17.7, t [264] = 2.23, $p=0.027$, d = 0.545). Total cooking skills confidence was also significantly higher in females (69.3 ± 16.2) compared to males (57.6 ± 16.6) (–11.7, 18.4%, 95% CI, –15.7 to –7.65, t [263] = –5.72, $p=<0.001$, d = 0.709). There was a significant difference in total cooking skills confidence between groups of cooking frequency (F [3, 262] = 4.45, $p=0.005$, $n^2=0.048$). Total cooking skills confidence increased from the 1–2 times per week group (56.6 ± 15.1) to the 3–4 times per week group (63.6 ± 17.2), to the everyday group (65.7 ± 17.6) to the 5–6 times per week group (66.5 ± 19.0), as displayed in Figure 2.

There were no significant differences observed between groups of education level. There were also no statistically significant correlations between age (years) and total cooking skills confidence and BMI (kg/m^2) and total cooking skills confidence.

Food skills

Mean food skill confidence was 83.8 ± 20.1 out of a possible 133 (63.0 ± 15.1%). Median scores for each of the 19 items are displayed in Figure 3 below.

Total food skills confidence was significantly higher in those that reported previous culinary training (95.2 ± 21.5) compared to those that did not (83.0 ± 19.8), (12.2, 13.7%, 95% CI, 2.65–21.8, t [264] = 2.51, $p=0.013$, d = 0.614). Females had greater total food

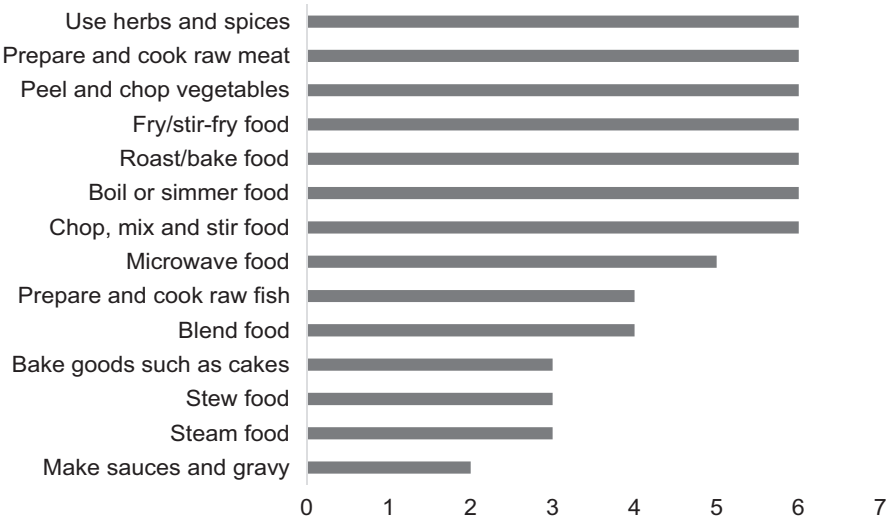

FIGURE 1 Cooking skills confidence rated on a scale of –7 where 1 means very poor and 7 means very good. Data are median scores.

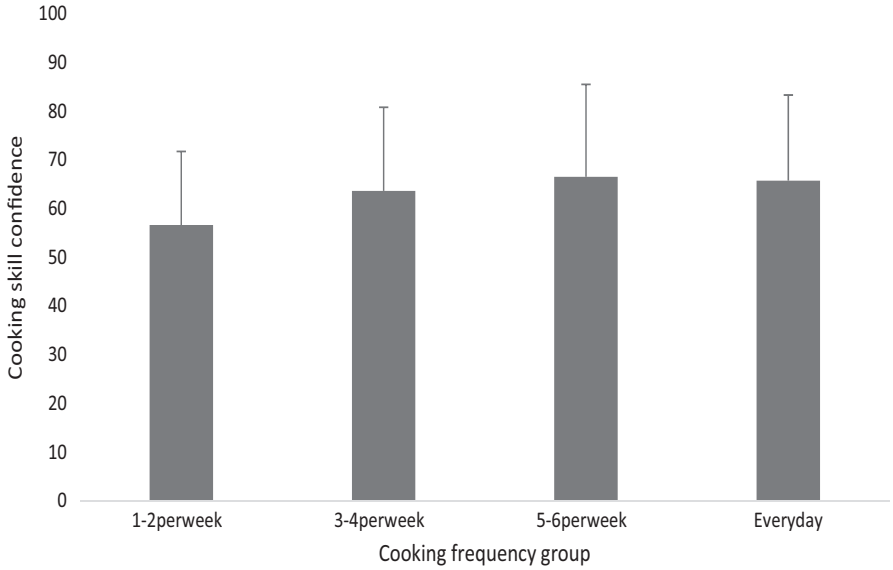

FIGURE 2 Cooking skills confidence compared by cooking frequency. Data are mean ± SD. *Statistically significant difference between 1–2 times per week and 5–6 times per week (9.88, 16.1%, 95% CI, 3.26–16.54, $p = 0.015$, d = 0.579), **Statistically significant difference between the 1–2 times per week and every day (9.08, 14.9%, 95% CI, 3.57–14.63, $p = 0.012$, d = 0.532).

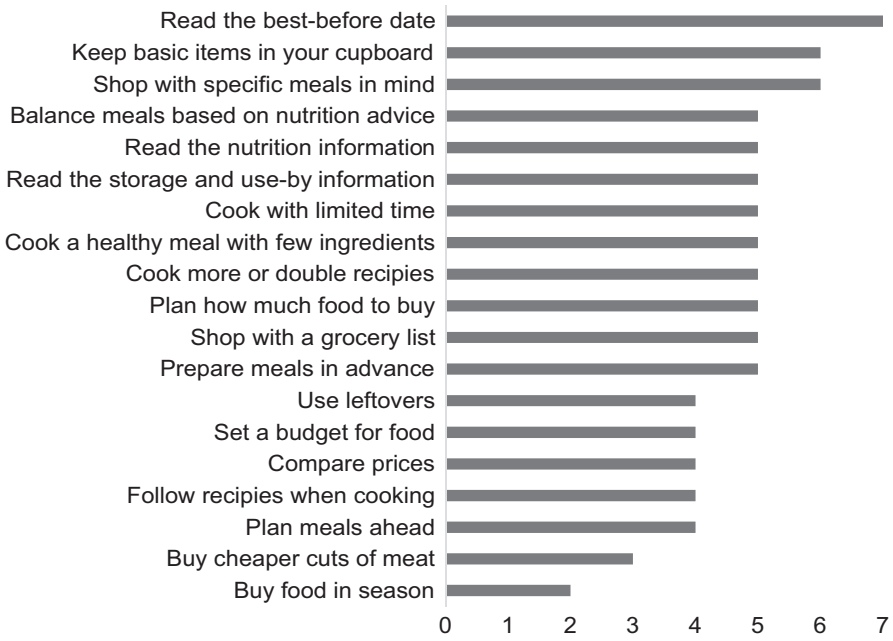

FIGURE 3 Food skills confidence is rated on a scale of 1–7 where 1 means very poor and 7 means very good. Data are median scores.

skills confidence (88.0 ± 19.8) compared to males (80.6 ± 19.8), (–7.47, 8.8%, 95% CI, –12.3 to –2.64, t [263] = –3.05, $p = 0.003$, d = 0.377). Total food skills confidence was different between different groups of cooking frequency (F (3, 262) = 6.37, $p < 0.001$, $n^2 = 0.068$). Total food skills confidence increased from the 1–2 times per week group (75.6 ± 19.3) to the 3–4 times per week group (84.9 ± 18.1), to 5–6 times per week group (85.6 ± 20.0) to everyday group (89.7 ± 21.0), in that order. Tukey's post-hoc analysis revealed that significant differences occurred between 1–2 times per week and 3–4 times per week (9.30, 11.6%, 95% CI, 3.38–15.22, $p = 0.017$, d = 0.477), 5–6 times per week (10.01, 12.4%, 95% CI, 2.56–17.44, $p = 0.040$. d = 0.514) and every day (14.11, 17.1%, 95% CI, 7.31–20.9, $p < 0.001$, d = 0.724). No other group differences were observed. There were no significant differences observed between groups of education level. There were also no statistically significant correlations between age (years) and total food skills confidence or BMI (kg/m^2) and total food skills confidence.

Cooking and food skill development

Most participants (48.5%) learned their cooking skills as a teenager (13–17 years), followed by as an adult (18+ years) (46.2%) and finally as a child (under 12 years) (5.3%). The most frequent learning source was recorded as the mother (49.2%), followed by trial and error (14.7%) and reading recipes (8.6%). Total cooking skills confidence was significantly different between different

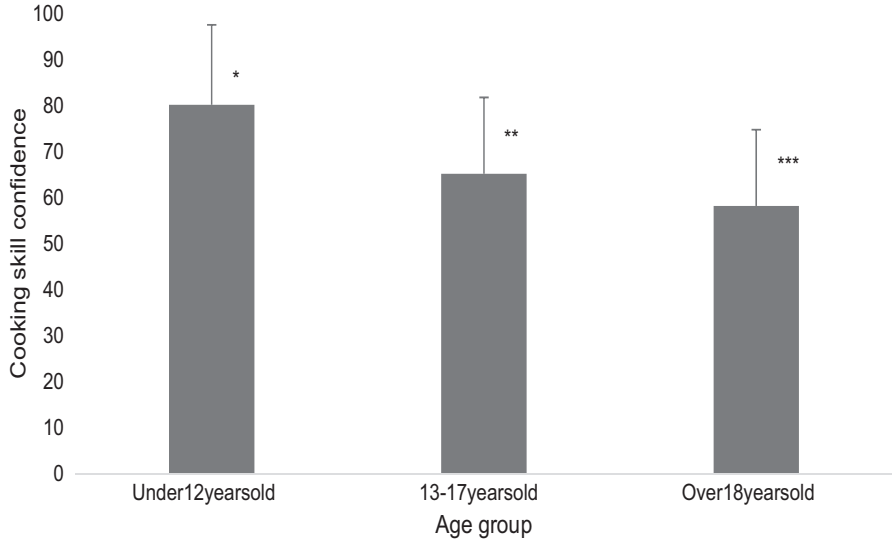

FIGURE 4 Cooking skills confidence compared by age group that most cooking skills were learned. Data are mean ± SD. *Statistically significant difference between an adult over the age of 18-year-old group to the child under the age of 12-year-old group (22.04, 31.8%, 95% CI, 12.43–31.58, $p < 0.001$, d = 1.325). **Statistically significant difference between the age of 13- to 17-year-old group to the child under the age of 12-year-old group (15.1, 20.6%, 95% CI, 5.45–24.55, $p = 0.004$, d = 0.905). *** Statistically significant difference between the adult over the age of 18-year-old group to the teenager between the age of 13- to 17-year-old group (6.98, 11.3%, 95% CI, 2.9–11.1, $p = 0.003$, d = 0.420).

groups of cooking learning stage (F [2, 263] = 13.7, $p < 0.001$, $n^2 = 0.094$). Total cooking skills confidence was greatest in those who learnt how to cook under the age of 12 years (80.2 ± 17.4) and decreased as learning age increased with those aged 13–17 years old scoring 65.2 ± 16.6 followed by those older than 18 years scoring 58.2 ± 16.6, as displayed in Figure 4.

There were no significant differences observed between the total food skills of different groups of cooking learning stage.

Food engagement

Participants' mean food engagement was 34.4 ± 5.8 out of a possible 50 (68.8 ± 11.6%). Total food engagement was higher in females (35.5 ± 5.9) compared to males (33.6 ± 5.6), (–1.9, 5.5%, 95% CI, −3.29 to −0.504, t [264] = −2.68, $p = 0.008$, d = 0.332). There was a statistically significant, positive correlation between total food engagement and total cooking skills confidence (rs = 0.573, $p = <0.001$). There was also a statistically significant, positive correlation between total food engagement and total food skills confidence (r = 0.617, $p = <0.001$).

General health interest

Participants' mean general health interest was 42.0 ± 5.6 out of a possible 70 (60 ± 8%) with similar scores observed for both females (42.7 ± 5.7) and males (41.6 ± 5.5). There was a statistically significant, positive correlation between total general health interest and total cooking skills confidence (rs = 0.329, $p = <0.001$), and between total general health interest and total food skills confidence (rs = 0.317, $p = <0.001$).

Diet quality

Participants reported a mean average of 2.7 ± 1.4 portions of vegetables per day, and 2.5 ± 1.3 portions of fruit per day, with a combined average of 5.1 ± 2.2 fruit/vegetable portions per day. There were statistically significant, positive correlations between total cooking skills confidence and fruit and vegetable portions consumed per day (rs = 0.258, $p < 0.001$), between total food skills confidence and fruit and vegetable portions consumed per day (rs = 0.212, $p < 0.001$), between food engagement and fruit and vegetable portions consumed per day (rs = 0.341, $p < 0.001$) and total general health interest and fruit and vegetable portions consumed per day (rs = 0.145, $p = 0.018$).

Hierarchical multiple regression models

Hierarchical multiple regression modelling was used to determine how much of the variance in cooking and food skills confidence score was accounted for by the predictor variables. All assumptions for the multiple regression were met.

In the regression analysis predicting cooking skills confidence (Table 3), all models were significant and numerous variables remained significant in the final

TABLE 3 Hierarchical multiple regression analyses for cooking and food skills confidence scores predicted by sociodemographic, cooking and food and psychological variables.

	Cooking skills		Food skills	
	B (SE)	β	**B (SE)**	β
Model 1: Sociodemographic	R2 change = 0.130*		R2 change = 0.0476*	
Age	0.178 (0.162)	0.0630	−0.313 (0.195)	−0.0959
Gender	6.282 (1.690)	0.1793***	1.599 (2.038)	0.0396
Education level	1.294 (0.846)	0.0846	1.159 (1.021)	0.0657
Model 2: Cooking and Food	R2 change = 0.121*		R2 change = 0.0847*	
Cooking frequency	0.822 (0.724)	0.0532	1.893 (0.874)	0.1062*
Previous culinary training	−8.222 (3.108)	−0.1188**	−9.809 (3.748)	−0.1230**
Cooking learning stage	−8.098 (1.527)	−0.2746***	−2.425 (1.841)	−0.0713
Model 3: Psychological	R2 change = 0.237*		R2 change = 0.3077*	
General health interest	0.371 (0.150)	0.1203*	0.430 (0.181)	0.1209*
Food engagement	1.389 (0.149)	0.4610***	1.854 (0.180)	0.5338***
Final Model R^2	0.488*		0.440*	

Note: *$p < 0.05$, ** $p < 0.01$, ***$p < 0.001$. B = unstandardised regression coefficient; SE = standard error of the coefficient; β = standardised coefficient.

model including: gender, previous culinary training, cooking learning stage, general health interest and food engagement, with food engagement having the strongest predictor value (β = 0.4610, $p < 0.001$). The final model accounted for 48.8% of the variance (R2) in cooking skills confidence score (Model F [8, 257] = 30.6, $p < 0.001$). In the regression analysis predicting food skills confidence (Table 3), all models were significant with cooking frequency, previous culinary training, general health interest and food engagement all contributing significantly to the final model, with the strongest contribution coming from food engagement (β = 0.5338, $p < 0.001$). The final model accounted for 44% of the variance (R2) in food skills confidence score (Model F [8, 257] = 25.24, $p < 0.001$).

DISCUSSION

This study aimed to evaluate the cooking and food skills confidence of team sport athletes and compared scores based on demographic characteristics. Participants' mean cooking skill confidence was 62.7 ± 17.4 out of a possible 98 (64.0 ± 17.8%) and mean food skill confidence was 83.8 ± 20.1 out of a possible 133 (63.0 ± 15.1%). In comparison with other populations assessed using the same assessment methods, team sport athletes have lower cooking and food skills confidence. In an Australian sample of young adults (aged 18–29 years), their cooking skills confidence mean was 76.70 (SD 12.11) and food skills confidence mean was 106.02 (SD 15.40) (Lavelle et al., 2020). Furthermore, worryingly, the athlete's scores are lower than a sample of young Australian adults with a recorded low diet quality, who have mean scores of cooking skills confidence of 70.2 (17.5) and food skills confidence of 96.0 (Median 83.5–107.5) (Whatnall et al., 2022). They are additionally lower than a general sample of American adults, American parents (Wolfson et al., 2020) and a small sample of Irish parents, albeit who may have a higher interest in cooking since they were included in a parent–child cooking intervention (Lavelle et al., 2023). Unfortunately, no further Irish or UK studies using the same assessment methods are available for comparison. As cooking and food skills could be considered essential procedural knowledge for optimising nutrition in athletes, it is particularly concerning that their scores are lower than a similar age population with measured low diet quality. Such poor diet quality has also previously been observed in team sport athletes (Jenner et al., 2019; Ó Catháin et al., 2020; Renard, Kelly, et al., 2021). It is important to note, however, despite the same assessment methods being used, these comparisons are with samples from different countries, namely, Australia (Lavelle et al., 2020; Whatnall et al., 2022) and America (Wolfson et al., 2020). Due to this, cultural differences related to food practices and traditions may partially explain the differences observed in cooking and food skills confidence between these groups. Based on such comparisons, team sport athletes would likely benefit from interventions targeting the development of their cooking and food skills confidence and competency. Development of cooking and food skills confidence in this population may subsequently lead to improvements in their dietary intake allowing for greater adherence to nutritional recommendations.

Our data demonstrate that those with previous formal culinary training reported significantly higher confidence in both cooking and food skills. Previous findings which compared confidence scores between experienced food preparers and novices also identified that experienced food preparers reported a higher

cooking skill confidence score of 79.67 compared to 71.07 and a food skills confidence score of 105.64 compared to 81.31 (Lavelle et al., 2017). Previous culinary training also contributed significantly to the hierarchal regression models for both cooking and food skills confidence. This provides further evidence to support the discriminate validity of the cooking and food skills confidence measure and highlights how future culinary training interventions may benefit participants' confidence in cooking and food skills.

In previous research, males, younger respondents and those with few/no education qualifications scored lower on both cooking and food skills confidence (McGowan et al., 2016). Similar gender differences were observed in this study with males scoring significantly lower compared to females for both cooking (57.6 vs. 69.3) and food skills confidence (88.0 vs. 88.6). However, there was a lack of significant differences when cooking and food skills confidence was compared by level of education, and neither cooking nor food skill confidence correlated with age. These data highlight that the largest discrepancies in cooking and food skills confidence were due to gender and no other sociodemographic characteristics reported. Differences in age and level of education were not observed in this study likely due to the greater homogeneity of the sample, which included individuals of a younger age (24.8 ± 6.1 years) with a majority educated to at least a degree level (54.2%). The differences in gender that were observed may be reflective of the fact that 65% of women compared to 29% of men have sole responsibility for meal preparation in the household (Smith et al., 2010). Interestingly, gender contributed significantly to the hierarchal regression model for cooking skills confidence but not the model for food skills confidence. This may be because cooking has traditionally been perceived as a 'woman's activity' (Beagan et al., 2008), with young girls feeling that they are expected to cook more and that it is their responsibility (Martin Romero & Francis, 2020; Mills et al., 2017). The gap found in this study may indicate that these societal norms with regard to cooking are still present and may need to be further actively targeted but despite this, both males and females need to utilise food skills such as planning and organising meals. With this in mind, targeted interventions should be utilised to empower individuals in optimising their food choices and overall diet quality (Lavelle et al., 2020). For this cohort of team sport athletes, male athletes may benefit the greatest from such future interventions.

Unsurprisingly, greater cooking and food skills confidence were observed for groups of individuals that reported higher cooking frequency. However, it remains unclear whether the higher confidence contributes to the greater frequency, or whether greater cooking frequency itself contributes to the greater confidence levels observed. Cooking frequency contributed significantly to the hierarchical regression model for food skills confidence but not cooking skills confidence. This potentially highlights the need for greater organisational and planning skills when cooking more often, as previously identified among adults during the COVID-19 pandemic (Murphy et al., 2020). Cooking more frequently at home (6–7 times/week) compared to less frequently (0–1 times/week) has previously been associated with lower energy, sugar and fat intakes (Wolfson & Bleich, 2015). It is important to note, however, that these changes in dietary intake are deemed positive from a public health perspective but may be contradictory to the higher energy needs of team sport athletes. Further research is required to identify whether greater cooking frequency also supports adherence to sports-specific recommendations for team sport athletes. It is also important for future research to explore the various sociodemographic factors specific to team sport athletes that might influence their cooking frequency. This may include whether or not they are living independently, whether total number of training hours per week influences their time available to cook or whether a greater number of years participating in team sports increases their exposure to cooking/nutritional advice.

When participants were asked from whom/where they learnt most of their cooking skills, the most frequent source was recorded as the mother (49.2%), similar to previous findings (Lavelle, Spence, et al., 2016). Learning cooking from the mother has previously been linked with a greater level of cooking skills and better dietary practices, and it has been suggested that family members should be included as part of future interventions (Lavelle, Spence, et al., 2016). Direct parental involvement in school-based public health interventions has previously proven to be beneficial for BMI and physical activity levels and may also benefit dietary behaviours (Verjans-Janssen et al., 2018). Future interventions in sports nutrition settings may, therefore, also benefit from direct parental involvement. In this study, those that learnt most of their cooking skills as a child (under the age of 12 years) displayed the greatest confidence in both their cooking and food skills, followed by those that learnt as a teenager (13–17 years) and finally as an adult (over 18 years old). Cooking learning stage also contributed significantly to the hierarchal regression model for cooking skills confidence. Previous research has highlighted teenage learners (13–17 years) to have the greatest confidence in their cooking and food skills (Lavelle, Spence, et al., 2016). Despite this discrepancy, both sets of data suggest that an earlier age of onset for cooking and food skill development could be more beneficial for confidence in cooking and food skills as an adult. Furthermore, cooking skills have been shown to track from earlier ages into adulthood (Laska et al., 2015) highlighting that earlier intervention in athletes could empower them with adequate skills for optimising their nutrition intake over their lifetime.

Positive correlations were identified between daily fruit and vegetable consumption and variables of cooking (rs = 0.258, $p < 0.001$) and food skills confidence (rs = 0.212, $p < 0.001$), food engagement (rs = 0.341, $p < 0.001$) and general health interest (rs = 0.145, $p = 0.018$). General health interest contributed significantly to the hierarchical regression models for both cooking and food skills confidence. This highlights how those that wanted to eat more healthily had greater confidence, as reported previously (Lavelle, McGowan et al., 2016). Food engagement score explained the greatest variance in the hierarchical regression models for both cooking and food skills confidence. Food engagement has previously been shown to correlate with both cooking and food skills confidence (O'Kane et al., 2022) and may be a variable of interest for future interventions. Overall, the hierarchical regression models explained a relatively high variance for both cooking skills confidence (48.8%) and food skills confidence (44%); however, many other unexplored factors may also contribute to cooking and food skills confidence. This highlights how choosing what to eat is a multifaceted task and not entirely predicted by single factors. Cooking and food skills should, therefore, not be a singular target of interventions designed to improve diet quality but should instead be combined with a wide range of knowledge and psychological-related factors which may also determine dietary intake and quality (McGowan et al., 2016). Recent insights from sports nutritionists also highlight that multifaceted sports nutrition programmes need to be designed and implemented to address the complexity of athlete dietary behaviour (Bentley et al., 2019).

For athletes to optimise training and performance, they need to consume sufficient energy for the work required and to support physiological adaptations (Kerksick et al., 2018). Unfortunately, team sport athletes consistently display dietary intakes which are insufficient in overall energy and carbohydrate consumed (Jenner et al., 2019; Renard, Kelly, et al., 2021). Such insufficient energy intake during periods of training can result in several performance detriments including loss of lean muscle mass, increased prevalence of overtraining and injury and possible endocrine and reproductive system disturbances (Kerksick et al., 2018). Investigations into the barriers and enablers of elite athletes' adherence to nutritional guidance have highlighted the importance of food planning skills (Bentley et al., 2021). Perception of effort to cook a healthy meal and possessing limited cooking skills have also been identified as barriers to nutritional adherence in sporting populations (Carter et al., 2022). As the population in this present study reported lower confidence in cooking and food skills compared to other population groups, future research should determine if increases in perceived confidence are sufficient to overcome such barriers and whether this leads to improvements in nutritional adherence.

Despite the frequent use of cooking workshops as part of applied sports nutrition practice, there are limited reports in the literature on the effectiveness of such workshops or interventions. A previous 4-week intervention which included social cognitive-based cooking workshops among students led to significant improvements in self-efficacy for food selection and food preparation (Ellis et al., 2018), although changes in dietary intake/quality were not measured. Another study evaluated the effects of a randomised nutritional intervention combining nutrition education and cooking workshops on the dietary intakes and psychosocial determinants of performance in university football athletes (Larose et al., 2022). The intervention consisted of three weekly 2-h sessions with cooking workshops aimed to combat barriers of time and cost to facilitate greater intention and perceived behavioural control. Increases in nutrition knowledge were observed in the intervention group, although no short-term impact on dietary intake, diet quality and other psychosocial determinants was observed (Larose et al., 2022). Both interventions lacked measures of cooking and food skills, so it remains unknown if these were developed and improved. To determine the impact of cooking skills interventions on dietary intake more robust interventions are required. These should be informed by baseline assessment of cooking and food skills confidence, so that skill development can be targeted effectively. Interventions that primarily focus on nutrition education and counselling are more common in the literature and they have previously been shown to increase nutrition knowledge and improve dietary intake in team sport athletes (Abood et al., 2004; Rossi et al., 2017; Valliant et al., 2012). A dietician-led nutrition education and counselling intervention with collegiate volleyball players previously led to improvements of 12.4% in nutrition knowledge score, 24% in total energy intake, 36% in carbohydrate intake and 22% in protein intake (Valliant et al., 2012). Considering this, the inclusion of cooking and food skills interventions is proposed as an adjunct strategy which may augment the results of existing methods of nutrition education and counselling.

Based on the findings of this study, the cooking and food skills confidence of team sport athletes is lower than other population groups and may serve as a barrier to adherence to sports nutrition recommendations. Future research should explore the cooking and food skills confidence of other athletes from different sports in addition to comparison groups sourced from the general population so that more direct comparisons can be established. This would help identify if any difference between type of sport exists (e.g., team vs. individual) and provide further evidence to either support or refute current comparisons of cooking and food skills confidence between team sport athletes and the general population. Future research should also assess if an athlete's level of confidence

is representative of their actual level of practical competency and skill. Future interventions would also benefit from a baseline assessment of what specific skills/areas require improvement and what specific barriers athletes face when trying to meet dietary intake targets. For example, lack of time and poor time management have been identified as barriers to home meal preparation in the general population (Jabs & Devine, 2006) as well as barriers to a healthy diet in a sporting context (Capling et al., 2020; Sharples et al., 2021). Team sport athletes consistently consume diets that are insufficient in overall energy intake (Jenner et al., 2019; Renard, Kelly, et al., 2021). Targeted interventions may, therefore, benefit the most by aiming to develop the cooking and food skills athletes can rely on to fulfil their higher dietary demands which may include skills such as preparing meals in advance, batch cooking and cooking with limited time. Such targeted interventions of a longer duration may also be required for the development of cooking and food skills confidence to translate to practically significant improvements in dietary intake.

Some limitations of the study must be considered. Self-reported confidence in cooking and food skills may not be truly representative of ability, and practical measures of cooking and food skills should be developed for future research. No comparison group from the general population was included; therefore, direct comparisons cannot be made and are instead limited to previous studies that used similar methods. Such indirect comparisons should be interpreted with caution as the samples were drawn from different countries and cultural differences may potentially influence cooking and food skills confidence. A representative sample of team sport athletes was aimed for and an inclusion criterion that all were required to participate in/train for a team sport, at least twice per week was used to facilitate this; however, no form of probability sampling was used. For the assessment of diet quality, a single question from the Dietary Instrument for Nutrition Education (DINE) validated tool (Roe et al., 1994) was used to assess fruit and vegetable consumption which gives a very limited picture of diet quality. Although beyond the scope of this current research, future research would benefit from a more thorough assessment of habitual dietary intake so that the relationship between cooking and food skills confidence and dietary intake can be explored in more detail. When attempting to measure habitual dietary intake in free-living athletes, attempts to validate the dietary intake data such as cross-referencing with other assessment techniques, analysing multiple time points and using Goldberg or Black cut-offs (Black, 2000; Goldberg et al., 1991) for the identification of under/over reporters should be performed (Burke et al., 2018).

In conclusion, the cooking and food skills confidence of team sport athletes in Ireland is lower than that reported by other population groups. Those that have previous culinary training, report greater cooking frequency, learnt to cook at a younger age and are female reported the highest cooking and food skills confidence. Based on these findings, future cooking interventions with team sport athletes should aim to address specific skill deficits based on a baseline confidence assessment and provide tailored interventions towards males and those with lower cooking frequencies. Cooking and food skills interventions should also target individuals in the early educational years at school to better equip them with the skills required for future healthy cooking habits (McGowan et al., 2016). By addressing gaps in cooking and food skills confidence and tailoring skill development to overcome common barriers such as lack of time, positive improvements in the dietary intake of team sport athletes may occur.

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CONFLICT OF INTEREST STATEMENT

No conflict of interest, financial or otherwise, is declared by the authors.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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