Associations between motives for dish choice during home-meal preparation and diet quality in French adults: findings from the NutriNet-Santé study

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Abstract

A number of motives such as constraints or pleasure have been suggested to influence dish choices during home-meal preparation. However, no study has evaluated how the importance conferred to these motives potentially influence diet quality. The present study aims at investigating the difference in diet quality according to the importance attached by individuals to various dish choice motives. The importance of twenty-seven criteria related to dish choices on weekdays was evaluated among 48 010 French adults from the NutriNet-Santé study. ANCOVA and logistic regression models, adjusted for sociodemographic and lifestyle factors, were used to evaluate the association between the importance attached to dish choice motives (yes *v.* no) and energy and food group intakes, as well as adherence to French nutritional guidelines (modified Programme National Nutrition Santé-Guideline Score (mPNNS-GS)). A higher adherence to nutritional guidelines was observed in individuals attaching importance to a *healthy diet* (mPNNS-GS score 7·87 (SD 0·09) *v.* 7·39 (SD 0·09)) and *specific diets* (mPNNS-GS score 7·73 (SD 0·09) *v.* 7·53 (SD 0·09)), compared with those who attached little/no importance (all $P < 0.0001$). These individuals also exhibited higher intakes of fruits and vegetables, but a lower consumption of meat, milk and cheese, sugary products and convenience foods compared with their respective counterparts (all $P < 0.0001$). For other motives, that is, *constraints*, *pleasure* and *organisation*, only small differences were observed. The main difference in diet quality was related to the importance placed on a *healthy diet*. Although a causal link should be demonstrated, our findings suggested that strategies aiming at enabling people to take into account diet quality during home-meal preparation might be effective levers to promote healthy eating.

Key words: Dish choices: Home-meal preparation: Diet quality: Cross-sectional studies

Over the past decades, lifestyle and food offer changes have led to an evolution of cooking practices in Western societies[1]. Overall, less time is spent in home-meal preparation[2,3] and an increasing part of the diet is provided by away-from-home sources (i.e. ready meals, eating out)[4–6].

A potential influence of cooking practices on the diet quality has been suggested in a few studies[7–12]. In particular, a greater frequency of food preparation in US young adults and adolescents has been associated with a better overall diet quality, including better compliance with nutritional guidelines[8], less frequent consumption of fast food[8], lower intake of fat and higher intakes of fruits and vegetables, fibre, folate and vitamin A[9]. Similarly, in US young adults, a greater frequency of food preparation predicted better diet quality 5 years later, including higher intakes of fruits, vegetables and dark green/orange vegetables, and lower consumption of sugar-sweetened beverages and fast-food[10]. The amount of time devoted to

food preparation in US adults has also been positively associated with indicators of higher diet quality including more frequent intake of vegetables, salads, fruits and fruit juices[11]. In addition, in Switzerland, cooking skills were shown to be positively associated with vegetable consumption and negatively with convenience food intakes[7]; furthermore, a community-based intervention in Scotland showed that improving cooking skills increases fruit consumption[12].

In addition to cooking barriers such as poor cooking skills[7,13,14] and time scarcity[2,15–19], which have been mainly studied in the literature, a number of additional motives could potentially influence dish choice and therefore the dietary quality of the meals prepared. If food choice motives during grocery shopping have been largely described in the literature[20–25], to our knowledge, only two have focused on food choices during home-meal preparation. A previous mixed-methods study, evaluating among fifty Dutch adults the motives

for choosing different meal solutions including homemade meals and different ready meals (e.g. frozen pizza, chilled hotpot), highlighted that the choice was the result of the balance between a number of criteria including health, convenience, taste, pleasure or price[26]. Furthermore, the latter study concluded that the prioritisation of one motive over the other could lead to different meal solutions[26] in which nutritional quality potentially differs. More recently, a quantitative study performed in the NutriNet-Santé cohort study supported that dish choices are governed by various motives including healthy diet, constraints, pleasure, specific diets and organisation[27]. Although the Dutch study suggested that motives governing dish choice are likely to influence the diet quality[26], no study so far has investigated the corresponding association with various dish choice motives. Assessing which motivations during home-meal preparation are correlated with a healthier diet appears to be of importance for guiding interventions to improve home eating habits.

The aim of the present study was therefore to evaluate the difference in diet quality according to the importance attached by individuals to various dish choice motives for home-meal preparation and adherence to nutritional guidelines, as well as energy and food intakes.

Methods

Study population

NutriNet-Santé (https://www.etude-nutrinet-sante.fr) is an ongoing web-based prospective observational cohort study launched in France in May 2009 with a scheduled follow-up of 10 years. It aims to investigate the relationship between nutrition and chronic disease risk, as well as the determinants of dietary behaviour and nutritional status. The study was implemented in the general French population (Internet-using adult volunteers, age ≥18 years). The rationale, design and methodology of the study have been fully described elsewhere[28]. In brief, to be included in the study, participants complete a baseline set of self-administered, web-based questionnaires assessing dietary intake, physical activity, anthropometric characteristics, lifestyle, socioeconomic conditions and health status. As part of the follow-up, participants are requested to complete the same set of questionnaires every year. Moreover, each month, participants are invited by email to fill in optional questionnaires related to dietary intakes, determinants of eating behaviours, nutritional and health status. This study is conducted in accordance with the Declaration of Helsinki, and all procedures were approved by the Institutional Review Board of the French National Institute for Health and Medical Research (IRB Inserm no. 0000388FW A00005831) and the Commission Nationale de l'Informatique et des Libertés (CNIL no. 908450 and no. 909216). All participants provided informed consent with an electronic signature. This study is registered in EudraCT (n2013-000929-31).

Data collection

Dish choice questionnaire. Data concerning dish choices were collected in September 2013 via an optional questionnaire, available for 6 months on the web platform. Information as to whether the participant was involved in the choice of dishes was firstly collected (never, sometimes, often, always) and participants who responded 'never' were exempted from answering the rest of the questionnaire. The questionnaire assessing determinants of dish choices was generated based on existing literature and the expertise of nutritionists, epidemiologists, sociologists and sensory specialists. The questionnaire included twenty-seven items on dish choice motives including commonly recognised factors such as preferences, eating habits, cooking practices, health, constraints related to time and food availability. Participants were asked the following question: 'When choosing the dishes you are going to cook, how important are the following criteria?' (in French: 'Quelle importance donnez-vous aux critères suivants lorsque vous choisissez le plat que vous allez préparer?'). The responses were rated on a five-point Likert scale ranging from 1 (not important at all) to 5 (very important), with each point on the scale represented by a word anchor. Information about dish choice motives was collected for weekdays and weekends separately. In addition, general information on cooking practices was self-reported by participants for both weekdays and weekends that is, time spent in meal preparation (<15, 15–30, 30–45, 45–60, >60 min), cooking skills (low, medium, high) and cooking enjoyment (yes, no). The full questionnaire is available elsewhere[27].

Sociodemographic, economic and lifestyle characteristics. At baseline and annually thereafter, participants in the NutriNet-Santé study were asked to provide sociodemographic data. For each participant, we used the data collected closest to the date at which the questionnaire on dish choice motives was filled in.

The variables used in the present study were the following: sex (men, women), age (18–29, 30–49, 50–64, ≥65 years), educational level (up to secondary school, some college or university degree), family status (living alone without children, living with a partner without children, living alone with at least one child, living with a partner with at least one child), and monthly income (<1200, 1200–1799, 1800–2699, ≥2700 euros per consumption unit (CU)). Monthly household income was calculated per CU, where 1 CU is attributed to the first adult in the household, 0·5 CU for other individuals aged ≥14 years, and 0·3 CU for children <14 years, following the national statistics methodology and guidelines[29]. Physical activity (low, moderate, high) was assessed using a short form of the French version of the International Physical Activity questionnaire[30]. The weekly energy expenditure expressed in metabolic equivalent task min/week was estimated, and three scores of physical activity were constituted (i.e. low (<30 min/d), moderate (30–59 min/d) and high (≥60 min/d)) according to the French guidelines for physical activity[30].

Dietary intake assessment. Dietary data were collected using at least three web-based 24 h dietary records randomly assigned over a 2-week period, including 1 weekend day and 2 weekdays. First, the participant reported all foods and beverages consumed at each eating occasion. Next, the participant estimated portion sizes for each reported food and beverage according to standard measurements or using photographs available via the interactive interface, taken from a validated picture booklet[31]. The weekly consumption of fish and seafood was assessed by a specific frequency question as infrequently consumed food.

For each participant, daily mean food consumption was calculated from the three 24 h records, weighted for the type of day (weekday or weekend day). Energy and food group intakes were calculated using the NutriNet-Santé composition table including more than 2000 foods[32]. Over-consumption was identified at both food and food group levels, using the food intake threshold defined by dietitians and nutritionists. According to the differences observed, different corrections were applied when possible, or the dietary record was deleted. Identification of under-reporting participants was based on the method developed by Black[15]. Participants detected as under-reporters were excluded from the analysis.

Adherence to nutritional guidelines was assessed using the Programme National Nutrition Santé-Guideline Score (PNNS-GS). The fifteen-point PNNS-GS is a validated *a priori* score reflecting adherence to the official French nutritional guidelines, which has been extensively described elsewhere[33]. Details on computation of this score are in the online Supplementary Table S1. In brief, it includes thirteen components: eight refer to food-serving recommendations (fruit and vegetables; starchy foods; whole-grain products; dairy products; meat, eggs and fish; fish and seafood; vegetable fat; water *v.* soda), four refer to moderation in consumption (added fat, salt, sweets, alcohol) and one component pertains to physical activity[33,34]. Points are deducted for over-consumption of salt (>12 g/d), added sugars (>17·5 % of energy intake) or when energy intake exceeds the needed energy level by >5 %. Each component cut-off was that of the threshold defined by the PNNS public health objectives when available,[34] otherwise they were established according to the French RDA[35]. For the present analysis, we computed a modified version of the PNNS-GS (modified Programme National Nutrition Santé-Guideline Score (mPNNS-GS)) which did not include the physical activity component. Therefore, the maximum score was 13·5.

Food groups included in the study were the following: fruits, vegetables, fish (including seafood and processed seafood), meat (including cooked ham and offal), eggs, milk, cheese, starchy foods (including potato, legumes, pasta, rice, other cereals, flour and whole-grain forms) with a specific focus on legumes and whole-grain starchy foods (including whole-grain pasta, rice, other cereals and flour), added fats (including oil, butter, margarine and vinaigrette), convenience food (e.g. pizzas, burgers, salted pies, sandwiches and fried meals), and sugary products (e.g. cakes, biscuits, sugars, honey, jam and chocolate).

Statistical analysis

We excluded from the analyses participants who reported never being involved in dish choices in the household and those who provided less than three 24 h dietary records since their inclusion in the study (i.e. completed between May 2009 and December 2014).

Sociodemographic and cooking practice characteristics of included and excluded participants were compared using χ^2 tests. χ^2 Tests were also used to compare participants' characteristic across importance given to dish choice motives.

Dish choice motives were identified for weekdays and weekends separately using exploratory factor analyses, fully described elsewhere[27]. In brief, as items are represented by ordinal variables, we used the unweighted least squares estimation method based on polychoric correlations[36]. The number of 'meaningful' factors to be retained was determined using common methods (i.e. Kaiser criterion[37], scree test[38], proportion of variance accounted for[37]). An item was considered to load onto a given factor if factor loading was ≥0·40 for that factor and <0·40 for the other factors[36]. Items having non-negligible loading (>0·30) for several factors were removed from further analysis. Internal consistency was evaluated using ordinal α-coefficients and reliability was considered acceptable if the coefficient exceeded the threshold of 0·60–0·70[39]. Scores on each of the factors drawn in the exploratory factor analysis were computed by averaging unweighted ratings for individual items. Scores could therefore range from 1 to 5. Mixed models for repeated data were used to assess differences between the levels of importance attached to each factor. Crude and adjusted (i.e. sex, age, educational level, monthly income, physical activity and family status) models were performed. Tukey's *post hoc* tests were used to evaluate pairwise differences.

In order to compare diet quality according to the importance attached (yes *v.* no) to the different dish choice motive factors, the latter factors (ranging from 1 to 5) were recoded as binary variables: important (average score ≥4) and not important (average score <4). This threshold was selected on the basis of the initial item scales labelling: 4 corresponding to 'important' and 5 to 'very important'. Sensitivity analyses using thresholds of 3 and 3·5 were also performed. As similar associations were observed in both contexts (i.e. weekdays, weekends) and because weekdays represent a larger part of the diet, only results for this context were presented.

ANOVA was used to evaluate the associations between the importance attached to dish choice motives (yes *v.* no) and energy intakes, whereas ANCOVA were used to evaluate the associations with mPNNS-GS and food groups that exhibited normal distribution. For food groups that did not exhibit normal distribution (i.e. eggs, legumes, whole-grain starchy foods and convenience foods), mainly because of a high proportion of non-consumers, a binary variable (consumer/non-consumer) was created and a logistic regression analysis was performed. All models were adjusted for sex, age, educational level, monthly income, physical activity, family status, energy (except for the model with energy as a dependent variable) and corresponding dish choice motives (e.g. the *healthy diet* model was adjusted for the four other dish choice motives) in order to control the potential effect of one dish choice motive factor on another.

For each food group, interactions between dish choice motives and different sociodemographic variables (i.e. sex, age, monthly income and educational level) were tested. However, overall, no significant effect was observed.

Given the large size of our sample, significant differences were observed for most subgroups, even if some of these were relatively small. We therefore defined a threshold of 5 % as meaningful nutritional differences and discussed only the dietary differences above this threshold. In addition, *P* values were adjusted for multiple testing using the Holm–Bonferroni method.

Missing covariate data were imputed using the multiple imputation method[40].

All tests of significance were two-sided, and $P < 0.05$ was considered significant. Statistical analyses were performed with SAS software (version 9.3; SAS Institute Inc.).

Results

From the initial sample of 53 025 individuals who answered the questionnaire about dish choice, an exploratory factor analysis was performed on the 50 915 individuals who had completed data for the weekday context. Analyses showed a five-factor solution[27] (Table 1). Results of the exploratory factor analysis and factor components have been fully described in a previous article[27]. In brief, the first factor consisted of five items corresponding to *healthy eating* motives (e.g. use of seasonal products, nutritional balance of the meal, my eating habits). The second factor included six items, all referring to *constraints* (e.g. time available for cooking, cooking skills, my state of fatigue). The third factor comprised five items referring to *pleasure* (e.g. my preferences, originality of the dish, recipes I come across). The fourth factor consisted of three items related to *specific diets* (i.e. diet for health status, diet to lose weight, diet for personal convictions). Finally, the fifth factor included three items concerning meal *organisation* (i.e. what I planned to eat, the dish can be prepared beforehand, the dish can be prepared in large quantities).

The importance attached to each of the factors differed significantly ($P < 0.0001$ for all paired comparisons), in crude and adjusted models.

From this initial sample of 53 025 individuals, 2110 participants reported never being involved in dish choice and were therefore not asked to complete the questionnaire. In addition, we excluded 2905 individuals with inadequate dietary measures (less than three 24 h dietary records or under-reporting), leading to a final sample of 48 010 individuals. Compared with excluded individuals, included individuals were more often women, aged 30–65 years, had higher educational level, higher monthly income, and were less likely to have children living in their household, more physically active, more likely to spend time on home-meal preparation, to have high cooking skills and to enjoy cooking (all $P < 0.0001$) (Table 2).

Table 3 shows adherence to nutritional guidelines, energy and food group intakes according to the importance assigned to each dish choice motive. Significant differences in diet quality were observed for all motives, although some were relatively small. The main differences were observed between individuals attaching importance to *healthy diet* and to a lesser extent to *specific diets* compared with their respective counterparts, whereas no meaningful nutritional differences were observed for *constraints*, *pleasure* and *organisation*. Regarding food group intakes, individuals attaching importance to a *healthy diet* and to *specific diets* had both higher intakes of fruits and vegetables, whereas they reported lower intakes of meat, milk and cheese and sugary products compared with their respective counterparts. These individuals were also more likely to consume whole-grain starchy foods and less likely to eat convenience foods. Individuals placing importance on a *healthy diet* were also more likely to consume legumes and individuals placing importance on *specific diets* were less likely to consume eggs. Individuals who gave importance to *organisation* exhibited higher intakes of fruits. In turn, no meaningful nutritional differences were found regarding

Table 1. Explanatory factor analysis of motives for dish choices on weekdays (*n* 50 915 individuals; NutriNet-Santé study 2013)
(Mean factors and standard deviations)

When choosing the dishes you are going to cook, how important are the following criteria?	Standardised factor loading	Internal consistency	Eigen value	Variance explained (%)	Mean	SD
Factor 1: healthy diet		0.75	4.82	48.3	3.93	0.62
Nutritional balance of the meal	0.87					
Nutritional balance of the dish	0.81					
Use of seasonal products	0.51					
My eating habits and/or that of my relatives	0.40					
What I and/or my relatives ate during the previous days	0.40					
Factor 2: constraints		0.68	1.89	19.0	3.77	0.56
Ingredients at my disposal	0.61					
Leftovers in my refrigerator/freezer	0.53					
My state of fatigue	0.53					
Time available for cooking	0.51					
My hunger and/or that of my relatives	0.45					
My cooking skills	0.41					
Factor 3: pleasure		0.66	1.21	12.1	3.39	0.59
What I and/or my relatives want to eat	0.62					
Originality of the dish	0.55					
My preferences and/or those of my relatives	0.54					
Recipes I come across	0.47					
The dish can be adapted to please all guests	0.39					
Factor 4: specific diets		0.69	1.09	11.0	2.80	0.99
My health status and/or that of my relatives	0.75					
My eventual diet to lose weight and/or that of my relatives	0.64					
My personal convictions and/or that of my relatives	0.47					
Factor 5: organisation		0.64	0.96	9.6	2.89	0.87
The dish can be prepared beforehand	0.71					
The dish can be prepared in large quantities	0.51					
What I planned to eat (meal planning)	0.49					

Table 2. Sociodemographic and lifestyle characteristics of included and excluded participants (*n* 48 010; NutriNet-Santé study 2013)

	Included (*n* 48 010)	Excluded (*n* 5015)	
	(%)	(%)	*P**
Sex			<0·0001
Women	55·0	79·6	
Men	45·0	20·4	
Age (years)			<0·0001
18–30	12·2	10·5	
30–50	29·3	35·9	
50–65	33·9	35·9	
≥65	24·7	17·7	
Education			<0·0001
Up to secondary school	42·2	34·1	
Some college	25·1	30·0	
University	28·2	33·3	
Missing data	4·5	2·6	
Monthly income (€/CU)†			<0·0001
<1200	16·8	14·0	
1200–1800	24·2	23·7	
1800–2700	22·4	24·9	
≥2700	25·0	26·6	
Missing data	11·7	10·8	
Family status			<0·0001
Living with a partner, with at least one child	23·0	25·7	
Living with a partner, without children	53·0	47·0	
Living alone, with at least one child	3·9	3·8	
Living alone, without children	20·1	23·5	
Missing data	0·02	0·02	
Physical activity level			<0·0001
Low	10·5	17·8	
Moderate	18·2	35·3	
High	15·2	28·3	
Missing data	56·2	18·6	

CU, consumption unit.
* *P* based on χ^2 test.
† 1 CU is attributed for the first adult in the household, 0·5 for other persons aged 14 years or older and 0·3 for children under 14 years.

food group intakes according to the importance attached to *constraints* and *pleasure*. Individuals placing importance on *constraints* were however more likely to be consumers of convenience foods whereas individuals who reported *pleasure* as important were less likely to be consumers of eggs, legumes, whole-grain starchy foods and convenience foods. For these models, the association of predicted probabilities and observed responses indicated percentage concordance ranging from 54·7 to 62·5 % according to the food group considered. Sensitivity analyses using thresholds of 3 and 3·5 were also performed and showed similar results.

Discussion

Using a large, population-based sample, we found that attaching importance to *healthy eating* and *specific diets* was associated with a better adherence to nutritional guidelines, higher intakes of fruits, vegetables, whole-grain starchy foods, and a lower consumption of meat, milk and cheese, sugary products and convenience foods. In turn, the importance attached to *constraints*, *pleasure* and *organisation* showed relatively small associations with diet quality, regarding adherence to nutritional guidelines and food intakes.

Individuals placing importance on a *healthy diet* were more likely to comply with French nutritional guidelines. In particular,

these individuals consumed more fruits, vegetables, starchy foods (including legumes and whole-grain starchy foods), whereas they were less likely to consume meat, dairy products and convenience foods. There is, to our knowledge, no data in the literature evaluating the association between motives during home-meal preparation and food intake. However, our results can be linked to previous data showing that an individual's concern about nutrition is positively related to the nutritional quality of the diet. In particular, several studies showed that a higher importance assigned to healthy eating was positively associated with adherence to dietary recommendations[41,42], as well as intake of fruit and vegetables[43–47], and fibres[46], whereas it was negatively associated with saturated fat intake[46]. In addition, health interest has been previously described as the most significant reason for reducing meat and meat products in the diet[48], thus supporting our results. One possible explanation to account for the reduced consumption of dairy products might be due to the ongoing debate about their possible negative impacts on health (e.g. increased risk for prostate cancer)[49]. As regards the use of convenience foods, in line with our results, a previous study investigating the motives behind different meal solutions (i.e. homemade meals, ready meals, take-out and eating out) highlighted that greater importance placed on health and well-being would encourage home-meal preparation, and decrease the recourse to convenience food[26].

Table 3. Associations between importance given to dish choice motives and adherence to nutritional guidelines (modified Programme National Nutrition Santé-Guideline Score (mPNNS-GS)) (*n* 48 010; NutriNet-Santé study 2013)*
(Mean values and standard deviations; odds ratios and 95 % confidence intervals)

	Factor 1: healthy diet						Factor 2: constraints						Factor 3: pleasure					
	Not important		Important				Not important		Important				Not important		Important			
	Mean	SD	Mean	SD	%diff†	P	Mean	SD	Mean	SD	%diff	P	Mean	SD	Mean	SD	%diff	P
mPNNS-GS‡	7·39	0·09	7·87	0·09	6·5‖	<0·0001§	7·69	0·09	7·57	0·09	−1·6	<0·0001§	7·66	0·09	7·59	0·09	−0·9	0·0003§
Energy (kJ/d)	8251	113	8058	113	−2·3	<0·0001¶	8096	113	8217	113	1·5	<0·0001¶	8247	113	8067	113	−2·2	<0·0001¶
Energy (kcal/d)	1972	27	1926	27	−2·3	<0·0001¶	1935	27	1964	27	1·5	<0·0001¶	1971	27	1928	27	−2·2	<0·0001¶
Fruits (g/d)	171·1	8·6	196·0	8·6	14·6‖	<0·0001§	188·0	8·6	179·1	8·6	−4·8	<0·0001§	187·7	8·5	179·4	8·6	−4·5	<0·0001§
Vegetables (g/d)	265·1	10·1	309·1	10·1	16·6‖	<0·0001§	290·9	10·1	283·3	10·1	−2·6	<0·0001§	293·8	10·0	280·4	10·1	−4·5	<0·0001§
Fish (g/d)	68·2	3·2	68·9	3·2	1·0	1·0§	69·4	3·2	67·75	3·2	−2·3	0·0078§	67·3	3·2	69·8	3·3	3·8	0·0002§
Meat (g/d)	125·2	4·0	116·7	4·0	−6·8‖	<0·0001§	120·7	4·0	121·2	4·0	0·4	1·0§	119·4	4·0	122·5	4·0	2·6	0·0003§
Dairy products (milk and cheese) (g/d)	140·2	8·2	127·7	8·2	−8·9‖	<0·0001§	132·1	8·2	135·8	8·2	2·8	0·0215§	137·1	8·2	130·9	8·2	−4·5	0·0004§
Total starchy foods (g/d)**	235·6	7·7	239·6	7·7	1·7	0·0001§	235·6	7·7	239·7	7·7	1·7	0·0001§	243·2	7·7	232·1	7·7	−4·6	<0·0001§
Added fat (g/d)	49·5	1·5	48·3	1·5	−2·5	<0·0001§	48·7	1·5	49·1	1·5	0·9	0·74§	48·9	1·5	48·9	1·5	0·0	1·0§
Sugary products (g/d)	151·9	5·4	143·4	5·4	−5·5‖	<0·0001§	144·4	5·4	150·8	5·4	4·4	<0·0001§	150·8	5·4	144·48	5·41	−4·2	<0·0001§
Eggs (g/d)						1·0††						1·0††						0·022††
OR	1·00		1·03				1·00		1·03				1·00		0·89			
95 % CI			0·98, 1·09						0·98, 1·08						0·84, 0·96			
Legumes (g/d)						<0·0001††						1·0††						0·0002††
OR	1·00		1·17				1·00		0·99				1·00		0·89			
95 % CI			1·12, 1·22						0·95, 1·03						0·85, 0·93			
Whole-grain starchy foods (g/d)‡‡						<0·0001††						1·0††						<0·0001††
OR	1·00		1·65				1·00		0·98				1·00		0·78			
95 % CI			1·58, 1·72						0·94, 1·03						0·73, 0·82			
Convenience foods (g/d)§§						<0·0001††						0·0029††						0·48††
OR	1·00		0·86				1·00		1·13				1·00		0·93			
95 % CI			0·82, 0·90						1·08, 1·19						0·88, 0·99			

Table 3. *Continued*

	Factor 4: specific diets						Factor 5: organisation					
	Not important		Important				Not important		Important			
	Mean	SD	Mean	SD	%diff	P	Mean	SD	Mean	SD	%diff	P
mPNNS-GS‡	7·53	0·09	7·73	0·09	2·7	<0·0001§	7·60	0·09	7·66	0·09	0·8	0·031§
Energy (kJ/d)	8272	113	8042	113	−2·8	<0·0001¶	8138	113	8175	113	0·5	1·0¶
Energy (kcal/d)	1977	27	1922	27	−2·8	<0·0001¶	1945	27	1954	27	0·5	1·0¶
Fruits (g/d)	178·4	8·5	188·7	8·6	5·8‖	<0·0001§	178·9	8·5	188·2	8·6	5·2‖	<0·0001§
Vegetables (g/d)	279·8	10·0	294·3	10·1	5·2‖	<0·0001§	283·2	10·0	291·0	10·2	2·8	<0·0001§
Fish (g/d)	69·1	3·2	68·1	3·3	−1·5	1·0§	68·8	3·2	68·3	3·3	−0·7	1·0§
Meat (g/d)	125·3	4·0	116·6	4·1	−7·0‖	<0·0001§	118·9	4·0	123·0	4·1	3·4	<0·0001§
Dairy products (milk and cheese) (g/d)	138	8·2	129·7	8·2	−6·1‖	<0·0001§	130·8	8·1	137·1	8·3	4·8	0·0015§
Total starchy foods (g/d)**	236·7	7·7	238·6	7·7	0·8	0·18§	238·0	7·6	237·2	7·7	−0·3	0·60§
Added fat (g/d)	50·0	1·5	47·9	1·5	−4·2	<0·0001§	48·9	1·5	49·0	1·5	0·3	1·0§
Sugary products (g/d)	151·2	5·4	144·1	5·4	−4·7	<0·0001§	147·5	5·4	147·8	5·4	0·2	1·0§
Eggs (g/d)						<0·0001††						1·0††
OR	1·00		0·82				1·00		0·99			
95 % CI			0·77, 0·88						0·92, 1·06			
Legumes (g/d)						0·48††						1·0††
OR	1·00		0·94				1·00		1·02			
95 % CI			0·89, 0·99						0·96, 1·08			
Whole-grain starchy foods (g/d)‡‡						<0·0001††						0·01††
OR	1·00		1·29				1·00		0·90			
95 % CI			1·22, 1·36						0·85, 0·95			
Convenience foods (g/d)§§						<0·0001††						1·0††
OR	1·00		0·78				1·00		0·99			
95 % CI			0·73, 0·83						0·92, 1·06			

* Importance placed on dish choice motives was defined by calculating the mean rating (five-point Likert scale) of items loading in each factor: important (mean score ≥4), not important (mean score <4).
† Percentage of difference in dietary intakes between individuals attaching importance *v.* those who do not, all such data.
‡ mPNN-GS: adherence to nutritional guidelines score.
§ *P* are based on ANCOVA models adjusted for other dish choice motives, sex, age, educational level, monthly income, physical activity, family status, daily energy intake, and other dish choice motives (corrected for multiple testing with a Holm–Bonferroni procedure).
‖ Meaningful nutritional differences, that is, over the threshold of 5 %.
¶ *P* are based on ANOVA models adjusted for other dish choice motives, sex, age, educational level, monthly income, physical activity, family status, and *P* other dish choice motives (corrected for multiple testing with a Holm–Bonferroni procedure).
** Total starchy foods includes potato, legumes, pasta, rice, other cereals, flour and whole-grain forms.
†† *P* are based on logistic regression models adjusted for other dish choice motives, sex, age, educational level, monthly income, physical activity, family status, daily energy intake, and other dish choice motives (corrected for multiple testing with a Holm–Bonferroni procedure).
‡‡ Whole-grain starchy foods includes pasta, rice, other cereals, and flour.
§§ Convenience food includes pizzas, burgers, salted pies, salted cakes, sandwich, fried meal.

Individuals attributing importance to a *specific diet* when choosing their dishes exhibited relatively better adherence to nutritional guidelines compared with their respective counterparts, although the differences were lower than those observed for the *healthy diet* motive. They also had higher intakes of fruits, vegetables and whole-grain starchy foods, whereas they reported lower intakes of meat, milk, cheese, eggs and convenience foods. Individuals could assign importance to this motive for various reasons such as diabetes, food intolerance or allergy, diet to lose weight, vegetarianism or religion. Most of these reasons are expected to lead individuals to adopt a healthier diet. However, given the differences in dietary practices across specific diets, results on food group intakes should be carefully interpreted. In the literature, health status[50,51] and weight preoccupation[50,51] have both been described as important motivations to eat healthily. In our study, the higher consumption of fruit and vegetables in individuals placing importance on a *specific diet* is consistent with many weight-loss diets[52], as well as vegetarian diets[53] and might be explained by their beneficial effects on health[54] in individuals dieting for health reasons. The lower consumption of meat is also consistent with vegetarian[53] as well as Mediterranean dietary patterns that could be followed for weight-loss[52] or health reasons[55]. Lower intakes of dairy products have been previously described in subjects with the metabolic syndrome[56] but can be also attributed to vegan and lactose-free diets. The higher consumption of whole-grain starchy foods is in line with vegetarian dietary patterns[57]. The lower intake of convenience food might be due to the unhealthy perception of such products[26], potentially exacerbated in individuals dieting to lose weight or for health reasons, and to concerns about their naturalness, more specifically among vegetarians[13].

Although people who attribute high importance to *healthy diet* or to a *specific diet* have a healthier diet, other motives may influence dish choices, thus potentially limiting the importance of healthy eating criteria. To support individuals taking into account such criteria, previous findings have emphasised the potential interest in giving people everyday practicalities to achieve a healthy diet during home preparation – that is, increasing food literacy that includes knowledge, skills and behaviours[58].

In our study, giving importance to *constraints, pleasure* or *organisation* was not associated or little associated with meaningful differences in terms of diet quality. Conversely, the literature reported significant associations between motivations behind food choices and dietary intake. Time spent on food preparation and cooking skills, which are often related to cooking constraints, have been previously associated with higher fruit and vegetables intakes[7,11]. Regarding pleasure, research on overeating and self-regulation has associated eating pleasure with short-term visceral impulses, potentially leading to high energy intake[59]. Finally, meal planning has been associated with a higher consumption of fruits[60,61]. These discrepancies might be explained by several hypotheses. First, the fact that individuals considered the motives as important might induce different behaviours. For example, constraints could have a negative impact on dietary quality but it can also lead individuals to plan their meals in advance, which has been

associated with a better diet quality[60]. Second, even if one motive is important, the balance with other motives may not induce a significant impact on diet quality. In particular, as our sample is highly interested in nutritional issues, they may attempt to conciliate *pleasure* and *constraints* with *healthy eating* or *specific diets*. Finally, it is also possible that individuals take into account, in an implicit way, these motives and therefore did not rate them as important.

Helping individuals to conciliate the different motives influencing their dish choice and encouraging them to confer importance to healthy eating appears to be a potential way to improve diet quality. Further, our results, considered together with the relationships established between cooking practices and dish choice motives[27] on one hand and cooking practices and diet quality on the other hand, suggest the interest in investigating how cooking practices potentially mediate the association between dish choice motives and diet quality. Such studies would provide more concrete applications in terms of public health policies.

Strengths and limitations

To our knowledge, this study is the first to provide a global approach on how dish choice motives are associated with diet quality. A major strength of our study was the use of at least three 24 h recalls, which allowed an accurate estimate of the dietary intakes[62]. The web-based tool used in the NutriNet-Santé study showed high agreement with the reference method – that is, interview with a dietitian[63], and a good validity against biomarkers to assess diet quality[64,65]. Dietary quality was assessed by different methods, including an *a priori* score evaluating adherence to nutritional guidelines and food group consumptions, in order to more precisely access eating habits. Another important strength of our study was the large sample size, including subjects with different sociodemographic and cooking practice characteristics.

The main limitation of our study is the use of a cross-sectional design, which does not allow drawing conclusion on causality. The issue of the generalisability of our results should also be raised as participants are volunteers in a long-term cohort and therefore are likely to be more health conscious and to have a higher dietary quality compared with the general French population. Furthermore, the profile of individuals included in the study compared with those excluded (more often women, aged 30–65 years, higher educational level, higher income, less likely to have children living in their household) may have exacerbated this characteristic. Given that participants were particularly interested in nutritional issues, desirability bias might have led to an over-estimation of the importance attributed to healthy eating criteria. In addition, our results have been potentially affected by common bias of auto-administered questionnaires, such as desirability bias. However, these may have been partially limited by the web-design which improves the feeling of anonymity[66]. A potential acquiescence bias should also be considered, especially because our questionnaire included a large number of items and the Likert scale included a middle point. The fact that item presentation was not randomised across participants might also have led to misreporting because of primacy effect

(i.e. the fact that participant responses are influenced by the data presented earlier) or because of lassitude at the end of the questionnaire. Another potential bias lies in the difficulty of participants to make an overall evaluation of their food choices as they might differ according to the context (e.g. type of meal, type of commensals, meal occasion). We attempted to partially limit this bias by evaluating separately weekdays and weekends. The use of a seven- or nine-point instead of a five-point Likert scale may have allowed individuals to more precisely estimate the level of importance they attribute to each criterion. However, this would increase the cognitive workload and completion time of the questionnaire, which may have discouraged some participants to finish it. Finally, the threshold of 5 % has been defined as a meaningful difference of diet quality; however, it is possible that smaller differences may also have nutritional implications at the population level.

Conclusion

In conclusion, this study highlighted that attaching importance on *healthy diet* and to a lesser extent *specific diets* is associated with better adherence to nutritional guidelines, and more specifically higher intakes of fruits, vegetables, whole-grain starchy foods, and lower intakes of meat, milk, cheese and convenience foods. Higher fruit intake was also found in individuals considering *organisation* as important. In turn, no meaningful nutritional differences were observed when importance was placed on *constraints* and *pleasure*. These findings suggest that enabling individuals to prioritise a healthy diet during home-meal preparation might potentially encourage better dietary quality. For this purpose, it seems important to develop the ability of individuals to cook dishes that are not only good for health but also pleasurable, under the specific constraints of individuals. Thus, cooking classes or specific apps providing adapted recipes appear as interesting strategies. Further prospective studies are needed to explore the causal relationships between dish choice motives and diet quality, and how cooking practices potentially mediate this relationship.

Supplementary material

For supplementary material/s referred to in this article, please visit https://doi.org/10.1017/S0007114517000666

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