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Dietary patterns in French home-living older adults: Results from the PRAUSE study

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ABSTRACT

The aim of the present study was to provide descriptive dietary patterns of home-living older adults, and to examine their association with sociodemographic and 'diet-related' variables, and health and psychological factors. Dietary patterns were analyzed using separately cluster analysis for men ($N = 151$, $M_{age} = 72.72$, SD = 8.80, range = 56-97) and women ($N = 251$, $M_{age} = 76.74$, SD = 9.95, range = 55-97) in 402 older adults aged 55 years and over. Cluster analyses showed four distinct dietary profiles for each gender. In older men, the four distinct dietary clusters were associated with any differences in sociodemographic and diet-related variables, cognitive function, and health and psychological factors. Likewise, in older women, the four distinct dietary clusters were associated with any differences in sociodemographic and 'diet-related' variables'. However in older women, results showed that the cluster 1 "high fish-fruit-vegetable" was associated with a better cognitive function, a better self-rated health and no depressive symptoms, whereas cluster 3 "moderate ready meals" was associated with cognitive decline, slight depression, and poor perceived health. Results emphasize the interest to take into consideration health and psychological factors associated with dietary patterns to better target the vulnerability of individuals and enable an effective prevention.

1. Introduction

Older adults continue to live increasingly longer in all countries and a large portion of older people live in their own residence. Many feel healthy and have the ability to continue to adapt themselves to their various living situations until advanced ages. Better life conditions and also healthy dietary patterns may explain this greater longevity. Dietary patterns are one of the most modifiable lifestyle factors and some studies have reported that healthy dietary patterns were not only related to better cognitive function in old age (Kesse-Guyon et al., 2012; Samieri et al., 2008), and to less chronic diseases (World Health Organization, 2003) but also played an important role in preventing or delaying onset of cognitive decline or dementia (Morris et al., 2002). Moreover, dietary patterns are likely to vary in older adults (Dubuisson et al., 2010) reflecting the complexity of dietary intake where foods have interactive, synergistic and antagonistic effects (Hu, 2002), and can be influenced by multiple determinants such as demographic, socioeconomic, health and psychological factors (Bertin et al., 2015). Some *a posteriori* methods in which dietary patterns are derived from statistical modeling such as factor analysis or cluster analysis have been used in dietary literature to provide information about existing dietary patterns. Factor analysis such as principal component analysis reduces diet variables into factors, and a clustering approach allows classifying individuals into relatively homogeneous subgroups. The specificity of these methods having the advantage of reflecting the real behavior of a population group (Hu, 2002), a clustering approach has been chosen in the current study.

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1.1. Gender differences in dietary patterns

Some studies have reported the importance of considering gender differences in dietary patterns, and have shown a differentiation of dietary patterns between men and women (Akbaraly, Sabia, Shipley, Batty, & Kivimaki, 2013; Larrieu et al., 2004; Payette & Shatenstein, 2005; Wardle et al., 2004). For example in 3C French study, Larrieu et al. (2004) have shown that women aged 65 years and more were characterized by a more regular consumption of fruits and vegetables and drank less alcoholic beverages than men. Eating fruits and vegetables is often identified as the most important part of a diet in preventing age-related disease (Hung et al., 2004). Regarding other socio-demographic factors, the education level is a key factor related to dietary patterns. A higher educational level was positively associated with healthier "fruits-vegetables" dietary patterns, whereas lower levels of education with less healthy "sweet-sugary drinks, fast and processed food" dietary patterns among older adults (Bamia et al., 2005; Larrieu et al., 2004). Larrieu et al. (2004) also showed that individuals living alone and people with a low educational level could be particularly at risk of the dietary intake and should be encouraged to eat more balanced meals. However, although some studies suggested that living alone, eating alone, and social isolation had a negative effect on dietary intake and particularly affected older women often widowed (Davis, Murphy, Neuhaus, & Lein, 1990), other studies have found that there could be healthy lifestyles in women associated with healthier and more balanced food choices (Tsubota-Utsugi et al., 2015) or with stronger healthy eating beliefs and motivation (Wardle et al., 2004). These findings consolidate the interest to separate analyzes between older women and men on dietary patterns, and to better take into account the sociodemographic characteristics of each gender.

1.2. Association between dietary patterns and health and psychological factors

The association between dietary patterns and cognitive function has been widely investigated in the last decade, whereas other factors have not. Self-rated health, functional disability and depressive symptoms tending to diminish or to increase with aging (Mehta, Yaffe, & Covinsky, 2002), are much less studied although they are considered as risk factors for morbidity and mortality (Lyyra, Lestinen, Jylhä, & Heikkinen, 2009). Few studies have focused on these factors and their relationships with dietary patterns. For example, Lai et al. (2014) have reported that high intakes of fruits, vegetables, fish and whole grains were associated with a reduced depression risk. Likewise, Samieri et al. (2008) have shown that "a healthy dietary pattern characterized by higher consumption of fish in men and fruits and vegetables in women was related to a good self-rated health in both sexes, and less depressive symptoms in women" (p.1466). In contrast, "processed food" (heavily loaded by sweetened desserts, fried food, processed meat, refined grains and high-fat dairy products) would be associated with an elevated risk of depression (Akbaraly et al., 2009). Feart et al. (2011) have shown in a study of French women aged 65 and over that a greater adherence to the Mediterranean diet was predictive of less functional disability. However, results are heterogeneous, diverse, and lead us to more closely examine the role of health and psychological factors and their associations with dietary patterns in home-living older adults.

1.3. The present research

The first objective of this study was to identify dietary patterns of home-living older adults by using cluster analysis. A second goal was to analyze whether clusters differ within groups with sociodemographic factors, cognitive function, functional disability, self-rated health and depressive symptoms. There are few studies that have examined the association of dietary patterns with all these factors, and this study can identify specific risk groups and thus facilitate some reflections.

2. Material and methods

2.1. Study population

The present study is a part of a French regional survey, a multidisciplinary research project labelled seniors' autonomy preservation in Poitou-Charentes (PRAUSE). The protocol of PRAUSE was approved by two National ethics committees: (1) "the general interest and statistical quality" label from the French National Council of Statistical Information (CNIS, visa n°2012 × 907RG); and (2) the French National Commission on Informatics and Liberty (authorization n°1593815). All participants signed an informed consent form. To be eligible for the recruitment into PRAUSE the older adults had to be (1) living in Poitou-Charentes; (2) aged 55 years and over; and (3) not institutionalized and not under guardianship or trusteeship. PRAUSE survey was administered in three sessions, and our study is in session 1 with 466 participants. The various data collection took place between 2011 and 2013. All participants were visited at home, and all face-to-face questionnaires were administrated by investigators who received collective training for all data collection in the older adults.

Of 466 participants 35 older adults were excluded for missing dietary information with more than 2 missing data on food items and 29 older adults for outliers in cluster analysis. The final sample size was 402 older adults with 251 women (M_{age} = 76.74, SD = 9.95, range = 55-97) and 151 men (M_{age} = 72.72, SD = 8.80, range = 56-97).

2.2. Dietary survey

A brief 27-item food frequency questionnaire (FFQ, Larrieu et al., 2004) was used. Participants were asked to report the frequency of consumption and serving sizes with which they are habitually consumed ("*Based on your current food consumption, how many times did you consume the following food products*"?). Frequency of consumption of foods was recorded in 11 classes with response options in consumption frequencies ranging from 0 (*never*) to 7 (*once a day or more*) and a field to mark the usual individual serving size per day (*if every day, how many serving sizes per day*?). See Table 1. Lastly, participants were questioned on how many days a week they drink alcohol and how many glasses they usually consume on a day when they drink wine.

2.3. Covariates

Sociodemographics included age, educational level, marital status and income level. Diet-related variables included loss of appetite, a diet for health reasons and snacking. See Table 2.

2.4. Cognitive functioning assessment

Global cognitive performance was assessed using the Mini Mental State Examination (MMSE) ranging from 0 (*highly altered performance) to* 30 (*normal performance*) (Folstein, Folstein & McHugh, 1975). Cognitive impairment was defined as a score below 24 (Canivet et al., 2015)

Table 1
Number of Servings per Week by Dietary Patterns by Gender and Clusters.

	Men				Women			
	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 1	Cluster 2	Cluster 3	Cluster 4
N of subjects	62	18	61	10	61	76	83	31
Z Cereals, bread, rusks	0.72	−0.39	−0.38	0.52	−0.40	0.31	−0.52	0.76
Z Starchy foods	0.35	0.17	−0.32	−0.29	0.07	0.29	−0.39	0.13
Z Pulses	0.42	0.57	−0.09	0.12	0.61	−0.47	−0.34	−0.17
Z Dairy products	0.42	0.05	−0.56	−0.08	−0.14	0.27	−0.59	1.51
Z Raw or cooked fruits	0.08	−0.26	−0.25	−0.39	0.66	−0.28	−0.44	1.15
Z Raw or cooked vegetables	0.60	−0.73	−0.64	−0.41	0.34	0.35	−0.53	0.50
Z Meat, poultry, eggs	0.58	−0.41	−0.17	−0.36	−0.32	0.15	−0.45	0.99
Z Fish and seafood	−0.12	−0.02	−0.42	2.83	0.70	−0.32	−0.14	−0.06
Z Ready meals	0.11	0.80	−0.07	−0.49	0.30	−0.32	0.32	0.14
Z Sweet products	0.54	0.25	−0.19	−0.37	−0.30	−0.03	−0.09	0.19
Z Sweet beverages	−0.06	−0.19	0.20	−0.27	0.53	−0.25	−0.07	−0.31
Z Alcohol	−0.06	2.79	0.01	−0.09	−0.33	−0.26	−0.06	−0.04
Z Wine	−0.31	−0.19	0.68	0.32	−0.01	−0.10	−0.19	0.09

2.5. Health and psychological factors

2.5.1. Functional assessment

Functional disability in instrumental activities of daily living (IADL) was assessed by 8-items according to the ability of the participants to use a telephone, manage medication, manage money, use public or private transport, and do shopping, the laundry, housework and prepare meals. A summary score ranges from 0 (*low functional disability, dependent*) to 8 *(high function, independent*) in each category.

2.5.2. Self-rated health

Participants were asked to rate their currently perceived own health on a scale from 0 (*worse health than you can imagine*) to 100 (*better health that you can imagine*).

2.5.3. Depressive symptoms

Depressive symptoms were assessed using the 30-items Geriatric Depression Scale validated in French by Bourque, Blanchard and Vezina (1990). A score of 0–9 is normal, a score 10–19 indicates a slight depression, and a score of 20 to 30 corresponds to a severe depression.

Table 2
Characteristics (Sociodemographic, Diet-related Variables) of the Participants According to Gender and Clusters.

	Men					Women				
	Cluster 1	Cluster 2	Cluster 3	Cluster 4	*p*	Cluster 1	Cluster 2	Cluster 3	Cluster 4	*p*
N of subjects	62	18	61	10		61	76	83	31	
Sociodemographic variables										
Age ($M \pm SD$	73.49 ± 8.57	75.24 ± 9.89	71.57 ± 8.41	70.39 ± 10.28	0.30	75.09 ± 10.12	76.48 ± 9.48	78.71 ± 10.39	75.38 ± 9.1	0.19
Less 75 years	36	9	43	7		28	29	29	13	
➢ 75 years	26	9	18	3		33	47	54	18	
Level of education					0.97					0.69
No diploma	4(6.5%)	1(5.6%)	1(1.6%)	–		2(3.3%)	1(1.3%)	1(1.2%)	1(3.2%)	
Primary school	22(35.5%)	6(33.3%)	22(36.1%)	4(40%)		31(50.8%)	44(57.9%)	48(57.8%)	15(48.4%)	
High school	24(38.7%)	8(44.4%)	28(45.9%)	4(40%)		18(29.5%)	22(28.9%)	28(33.7%)	9(29%)	
University	12(19.4%)	3(16.7%)	10(16.4%)	2(20%)		10(16.4%)	9(11.8%)	6(7.2%)	6(19.4%)	
Marital status					0.15					0.13
Married	47(75.8%)	10(55.6%)	47(77.1%)	6(60%)		23(37.7%)	23(30.3%)	21(25.3%)	12(38.7)	
Unmarried	15(24.2%)	8(44.4%)	14(22.9%)	4(40%)		38(62.3%)	53(69.7%)	62(74.7%)	19(61.3%)	
Income level					0.10					0.75
Less than 1500	7(11.3%)	3(16.7%)	3(4.9%)	5(50%)		25(41%)	39(51.3%)	47(56.6%)	16(51.6%)	
1500–3000 euros	28(45.2%)	7(38.9%)	28(45.9%)	3(30%)		23(37.7%)	21(27.6%)	21(23.3%)	9(29%)	
≥3000 euros	23(37.1%)	7(38.9%)	21(34.4%)	2(20%)		8(13.1%)	9(11.8%)	4(4.8%)	4(12.9%)	
No answer	1(1.6%)	1(5.5%)	1(1.6%)	–		2(3.3%)	5(6.6%)	11(13.3%)	2(6.5%)	
Do not know	3(4.8%)	–	8(13.1%)	–		3(4.9%)	2(2.6%)	–	–	
Diet-related variables										
Loss of appetite					0.23					0.83
No	58(93.5%)	14(77.8%)	57(93.4%)	9(90%)		46(75.4%)	56(73.7%)	64(77.1%)	24(64.5%)	
Yes moderately	2(3.2%)	4(22.2%)	4(6.6%)	1(10%)		10(16.4%)	15(19.7%)	16(19.3%)	6(19.4%)	
Yes significantly	2(3.2%)	–	–	–		5(8.2%)	5(6.6%)	3(3.6%)	1(3.2%)	
Diet					0.48					0.16
No	49(79%)	14(88.9%)	54(88.5%)	8(80%)		51(83.6%)	59(77.6%)	67(80.7%)	20(64.5%)	
Yes	13(21%)	4(22.2%)	7(11.5%)	2(20%)		10(16.4%)	17(22.4%)	16(19.3%)	11(35.5%)	
Snacking					0.75					0.78
No	45(72.6%)	16(88.9%)	48(78.7%)	8(80%)		41(67.2%)	46(60.5%)	57(68.7%)	21(67.7%)	
Yes	17(27.4%)	2(11.1%)	13(21.3%)	2(20%)		20(32.8%)	30(39.5%)	26(31.3%)	10(32.5)	

2.6. Statistical analyses

Analyses were performed with SPSS version 21 for Windows, and statistical significance was set at $p = 0.05$. First, a cluster analysis using the two-step procedure recommended by Hair, Anderson, Tatham, and Black (1978) was conducted in an attempt to provide the most stable solution for identifying dietary patterns among older men and women. Z scores were used to perform the cluster analyses. A hierarchical approach using Ward's linkage method and squared Euclidean distance as the similarity measure was first taken to aid in assessing the most appropriate number of clusters represented in the data. Agglomeration coefficients from the hierarchical analysis were examined and the percentage change in coefficient indicated four profiles for men and four profiles for women. Next, a non-hierarchical k-means cluster analysis was conducted, specifying a four-cluster solution. Because cluster analysis is sensitive to the order of the cases, we randomly changed the order of the cases for both the men and women samples and re-run the hierarchical and k-mean cluster analyses. The results of cluster analyses (hierarchical and k-mean cluster analyses) for the men and women samples were not impacted by changing the order of the cases. Similarly, the cluster solutions were close for both the hierarchical and K-mean cluster analyses, providing evidence for the robustness of the four-cluster solution on the basis of the frequency of food, alcohol and wine consumption observed among the older men and women. This solution with four clusters was identified as the more adequate for both men (20.82% of change in the coefficients between the solution with three clusters and the solution with four clusters and only 8.72% of change between the solution with four clusters and the solution with five clusters) and women (19.15% of change in the coefficients between the solution with three clusters and the solution with four clusters and only 11.13% of change between the solution with four clusters and the solution with five clusters). Then, a multivariate analysis of variance (MANOVA) for men and women was conducted on dietary patterns as a function of group membership to test whether the dietary patterns differed across the clusters.

Second, we performed MANOVAs with sociodemographic and diet-related variables, then with cognitive function, functional disability, self-rated health and depressive symptoms considered as dependent variables. Partial eta-squared (η^2) was calculated as an estimate effect-size for all variables between and within group differences.

3. Results

3.1. Clusters

In men ($N = 151$), four clusters were identified. The first cluster was characterized by "high intake of cereals, green vegetables, meat, sugar products, dried vegetables and dairy products" and represented 41.1% of the sample ($n = 62$). The second cluster was characterized by "low intake of green vegetables and meat" and represented 11.9% of the sample ($n = 18$). Participants in this cluster showed low intake of green vegetables and meat, and high intake of alcoholic beverages, ready-meals and pulses. The third cluster was characterized by "low intake of green vegetables, dairy products, fish, cereals and starchy foods" and represented 40.4% of the sample ($n = 61$). Participants in this cluster showed low intake of green vegetables, dairy products, fish, cereals and starchy foods – high consumption of wine. Lastly, the fourth cluster was characterized by "high intake of fish and cereals" and represented 6.6% of the sample ($n = 10$). Participants in this cluster showed high intake of fish and cereals and low intake in vegetable, ready-meals and sweet products. See Table 1. Results of MANOVA revealed a significant effect of cluster membership on dietary patterns, Wilks' Lambda = 0.05, $F_{(39,400.5)} = 18.59$ $p < 0.001$, $\eta^2 = 0.64$ (large effect size) indicating that men in clusters differed on dietary patterns apart from fruit consumption and sugary drinks. Male participants eat few fruits and drink few sugary drinks.

In women ($N = 251$), four clusters were identified. The first cluster was characterized by "high intake of fish and seafood, fruits, pulses and sweetened beverages" and represented 24.2% of the sample ($n = 61$). The second cluster was characterized by "moderate intake of vegetables, cereals, starchy foods and dairy products" and represented 29.8% of the sample ($n = 76$). Participants in this cluster showed moderate intake of vegetables, cereals, starchy foods and dairy products and low in pulses, fish and ready-meals The third cluster was characterized by "moderate intake of ready-meals" and represented 33.8% of the sample ($n = 83$). Participants in this cluster showed moderate intake of ready-meals and low in other food groups. The fourth cluster was characterized by "high intake of dairy products, fruits, meat, cereals and vegetables" and represented 12.3% of the sample ($N = 31$). See Table 1. Results of MANOVA revealed a significant effect of cluster membership on dietary patterns, Wilks' Lambda = 0.09, $F_{(39.696,)} = 22.69$ $p < 0.001$, $\eta^2 = 0.55$ (large effect size) indicating that women differed on dietary patterns apart from sweet products and alcohol and wine consumption. Women participants eat few sweet products and drink fewer alcoholic and wine beverages.

3.2. Cluster group differences on sociodemographic and diet-related variables

A MANOVA was conducted to determine if cluster group differences existed on sociodemographic and 'diet-related' variables. We examined differences on the basis of age, level of education, marital status, and income level, loss of appetite, diet and snacking. No significant differences on these variables were observed in men and women clusters ($p = 0.18$ and $p = 0.67$ respectively). Men are mostly less than 75 years old and mainly married, have a moderate level of education, a medium income, and a self-perceived good health. They are not cognitively impaired and depressed, have a little functional disability and few problems associated with loss of appetite, diet or snacking. Women are older than men, mainly either widowed or married, less educated, have lower incomes and little functional disability, and have a greater loss of appetite (24.3% versus 7.3%) and higher snacking (34.26% versus 23.2%) than men. See Table 2

3.3. Cluster group differences on cognitive function, functional disability, self-rated heath and depressive symptoms

MANOVAs were conducted to determine if cluster group differences existed on cognitive function, functional disability, self-rated health and depressive symptoms. The results are presented in Table 3. In men, there was no significant association between each cluster and cognitive function, functional disability, self-rated heath and depressive symptoms (Wilks' Lambda = 0.91, $F_{(12.341.6)} = 1.05$, $p = 0.40$). In women, the analyses revealed a significant effect of cluster membership on cognitive function, depressive symptoms and self-rated health (Wilks' Lambda = 0.89, $F_{(12.590.2)} = 2.13$ $p = 0.01$, $\eta^2 = 0.04$) (low effect size). Follow up ANOVAs indicated a significant effect of cluster membership on cognitive function ($F_{(3,229)} = 2.59$, $p = 0.05$, $\eta^2 = 0.03$), self-rated health ($F_{(3,229)} = 2.69$, $p = 0.05$, $\eta^2 = 0.03$) and depressive symptoms ($F_{(3,229)} = 4.95$, $p = 0.002$, $\eta^2 = 0.06$), and no effect of cluster membership on functional disability scores ($F_{(3229)} = 1.56$, $p = 0.20$). Post hoc Tukey HSD tests revealed significant differences between clusters. In other words, participants in cluster 3 characterized by "moderate intake of ready-meals" have

Table 3
Mean and SD of Cognitive Function, Function Disability, Self-Rated Health and Depressive Symptoms according to the Clusters.

	Men				Women			
	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster
	1	2	3	4	1	2	3	4
N of subjects	62	18	61	10	61	76	83	31
	M SD	*M SD*	*M SD*	*M SD*	*M SD*	*M SD*	*M SD*	*M SD*
MMSE/30	27.43 ± 2.25	27.69 ± 2.06	27.69 ± 2.34	26.70 ± 3.71	27.39 ± 2.39	26.72 ± 4.33	25.46 ± 6.63	27.78 ± 1.97
Functional disability/8	6.46 ± 1.65	6.69 ± 1.70	6.94 ± 1.52	6.60 ± 1.62	7.49 ± 1.15	7.33 ± 1.15	7.01 ± 1.58	7.25 ± 1.08
Self-rated health/100	71.54 ± 15.57	67.38 ± 18.26	76.17 + 12.67	72.20 ± 16.03	73.68 ± 14.91	69 ± 17.11	66.63 ± 17.65	64.39 ± 16.50
Depressive symptoms/30	5.57 ± 3.96	6.63 ± 4.08	5.98 ± 4.09	4.20 ± 3.01	7.19 ± 4.07	9.94 ± 6.24	10.97 ±6.03	9.61 ± 5.86

significantly lower levels of cognitive function and self-rated health than participants in cluster 1 characterized by “high intake of fish and seafood, fruits, pulses and sweet beverages”. Participants in cluster 4 characterized by “high intake of dairy products, fruits, meat, cereals and vegetables” have significantly lower level of self-rated health than participants in cluster 1. Lastly, participants in cluster 2 characterized by” moderate intake of vegetables, cereals, starchy foods and dairy products” and in cluster 3 characterized by “moderate intake of ready-meals” have significantly higher levels of depressive symptoms than participants in cluster 1.

4. Discussion

This study provides descriptive dietary patterns of home-living older adults, and their association with sociodemographic and diet-related variables, cognitive function and health and psychological factors.

In older men, the results show that the four distinct dietary clusters are associated with any difference in sociodemographic and diet-related variables, cognitive function and health and psychological factors. These results could be in part explained by the characteristics of these older men. They are less than 75 years, are mainly married, have moderate level of education and median income. They perceive their health as good, have little cognitive impairment and functional disability and are not depressive. They reported that they had few problems associated with loss of appetite, diet or snacking. Regarding dietary patterns, although distinct, participants have in common eating few fruits and drinking few sweetened beverages. All these data may suggest that the older men perceive themselves as healthy. However, some remarks can be made. Some dietary clusters are more or less healthy. For example, the cluster 2 characterized by “low intake of green vegetables and meat ” and the cluster 3 characterized by “low intake of green vegetables, dairy products, fish, cereals and starchy foods” may be considered as unhealthy, suggesting that health risks may be underestimated by these participants or they ignore the health risks of these elements. More information is needed, and particularly on the participants’ living arrangements to provide more profound results.

In older women, the results show that the four distinct dietary clusters are associated with some differences in cognitive function and health and psychological factors, and with any differences in sociodemographic and diet-related variables, although their characteristics are different from those of older men. They are older than men, mainly either widowed or married, less educated, have lower incomes and little functional disability, and have a greater loss of appetite and higher snacking than elderly men. Although some studies have shown that some of these sociodemographic characteristics (advanced age, low income, living alone) may affect food availability and could be associated with poor dietary patterns, their relationships are complex. The various characteristics of people living alone and the complex social changes related to living conditions should be more thoroughly investigated. Results only showed that the cluster 1 characterized by “high intake of fish, seafood, fruit, vegetables and sweetened beverages” and considered as a relatively healthy cluster was associated with a good cognitive function, a good self-rated health and no depressive symptoms. These results are in agreement with previous studies that have shown that frequent fish consumption (Barberger-Gateau, Jutand, Letenneur, Larrieu, Tavernier, & Berr, 2005) as well as higher consumption of vegetables (Kang, Ascherio, & Grodstein, 2005; Shatenstein et al., 2012) have been found to be associated with better cognitive performance in older women. In contrast, the cluster 3 characterized by “moderate ready-meals” represents an important group in this population which can be at risk for both poor nutrition and health. Here, the health risk is represented by a decreased cognitive function, a slight depression, and a poor perceived health. This result is of particular importance when examining dietary patterns, and emphasizes the interest to take into consideration health and psychological factors. However some remarks can be made. Remnant and Adams (2015) investigated the relationship between industrial ready-meals, cost and nutritional content, and found that although nutritional content of ready-meals varied across meal and type, the cost of meals “was positively associated with weight, energy fat, saturated fat, protein and fibre” (p.6). Naruseviciute, Whybrow, Macdiarmid and McNeill (2015) underlined that we could have an over-simplified view on the fact that cooking at home rather than buying ready-meals was healthier and cheaper, and suggested that “making healthier meal choices might be more complex for improving diet quality than knowing whether meals are bought ready or prepared in the home”. Gustafsson (2002) has suggested that a more qualitative research was required to better understanding the relationship between ready-meals and the decrease of health and psychological factors.

Some limitations should be considered when interpreting these findings. First, due to the cross-sectional design of this study, one cannot infer causality. Second, we used a cluster analysis approach. This approach is very useful for descriptive purposes, although its results may have limited generalizability. The sample size is a major limit since some dietary clusters reflect small groups. Hence, the power to detect significant associations between clusters and other variables (i.e., cognitive function, functional disability, self-rated heath and depressive symptoms) was limited and could partly explain the non-significant results observed in older men. Moreover, we have excluded in our analyses some number of older people for incomplete data and outliers. Among the 35 older adults excluded for incomplete data in dietary patterns, older women were more represented (68.6%) were older (M_{age} = 88.69 years), and all excluded people had a lower MMSE (≤24), suggesting a potential selection bias. Third, the assessment of dietary patterns should be taken with caution based on possible measurement

errors of FFQ. Moreover, given that the dietary questionnaire was self-reported by older adults, desirability bias is possible.

5. Conclusion

Despite these limitations, this study provides some insights for future research. Results add to the literature on dietary patterns in older adults. They suggest that older men within this survey are a population to monitor and stress the interest to take into account health and psychological factors associated with dietary patterns to better target the vulnerability of individuals and enable an effective prevention, here in older women. However, dietary patterns, including lifestyle, social and environment conditions should be further examined (Mercille et al., 2016). Describing dietary patterns in relation to living factors would add considerable support how they differ between men and women.

Conflict of interest

None

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