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The association between motivation and diet quality in older runners

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Abstract.
OBJECTIVE: To associate motivation with diet quality in older people (OP) who practice running.
METHODS: Cross-sectional observational analytical study, which was applied to a probabilistic sample of OP who practice running. Each participant was applied a survey including sociodemographic variables and experiences concerning the practice of Running, diet quality questionnaire for OP (ECAAM, for its acronym in Spanish) and the Motivation of Marathoners Scales-34 (MOMS-34) were used.
RESULTS: The total number of participants was 68, who were mostly men (69.1%), the predominant age was 60–69 years (69.1%). Women showed a higher proportion in diet quality when compared to men (71.4% vs 36.2%). The association between motivation subscales and food groups showed that the Weight Concern subscale was associated with junk food (Δ=1.55 (95% CI: 0.58; 2.52). The Personal goal achievement-Competition subscale was associated with meat (Δ=1.81 (95% CI: 0.62; 3.00). Recognition was associated with meat (Δ=1.12 (95% CI: 0.22; 2.03), and Health Orientation with alcohol (Δ=0.76 (95% CI: 0.02; 1.50).
CONCLUSIONS: Motivation is positively associated with diet in OP who practice running, especially for the motivation subscales Weight Concern, Personal goal achievement-Competition, Recognition and Health orientation.

Keywords: Running, physical activity, diet, motivation, older person

1. Introduction

The aging of the population, that is, the increase in the proportion of people aged 60 years and older, is a phenomenon that affects humanity at a global level [1]. Population aged 60 and above will rise from 900

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million in 2015 to 1.4 billion in 2030, representing an increase of 65% of OP worldwide [2].

In this context, Chile faces a rapid population aging, and it is estimated that population over 60 years of age will represent 18.9% of the global population in 2035. Furthermore, life expectancy at birth has tripled, going from 23.6 years for women and 23.5 years for men in 1900 to 82.1 years for women and 77.3 years for men in the period 2015–2020; by 2035, figures will be 86.0 and 80.9 years, respectively [3].

The gap between life expectancy and healthy life expectancy results in people reaching old age having associated comorbidities [1]. The WHO developed a Global Action Plan for the prevention and control of noncommunicable diseases. This action plan takes a special interest in modifying lifestyle, promoting among other factors, physical activity, and healthy diet [4], because of their demonstrated benefits on health and quality of life of OP [5–8].

At a global level, diet is characterized by a low intake of whole grain cereals, fruits, vegetables, seeds and, on the other hand, a high intake of sodium, sugary drinks, and processed meat [9]. In Chile, according to the last National Health Survey, diet of OP stood out for including a low consumption of fruits and vegetables, fish, pulses, and a high intake of salt [10]. Additionally, a study conducted by Candia et al. including 458 OP, found that women had a healthier diet when compared to men, and it was observed that the older the age the better the nutrition, especially in men [11].

The National Survey on Physical Activity and Sports Habits, applied to the population aged over 18, indicates that as people grow older there is a decline in the practice of physical activity and/or sports [12]. Evidence shows that regular physical activity is safe for healthy and frail older people (OP) [13]. Moreover, the risks of developing cardiovascular diseases, obesity, falls, cognitive impairment, osteoporosis and muscle weakness are reduced when practicing regular activities ranging from low intensity walking to more vigorous sports and resistance exercise such as running [13–15]. In Chile, Running has been reported as the third leading physical-sport activity among physically active adults (11.9%), after football and fitness training [16].

At Latin American level, research studies related to motivation and runners have used the Motivations of Marathoners Scale-34 (MOMS-34) [17], and have analyzed differences in relation to sex, sociodemographic variables, and training in Spanish and Mexican populations, with a small proportion being OP [18, 19]. Similarly, and specifically in the group of OP runners, recently there have been reports of an association between the level of physical activity and motivation in the Chilean population [20]. Regarding nutritional aspects and motivation, a lower BMI in population of different ages has been identified as a predictive factor for motivation to run in the subscales Health Orientation and Personal goal achievement-Competition [19]. However, no literature that relates motivation to run using the motivation scale (MOMS-34) and diet quality in OP has been found to this date.

Evidence has been provided for diet behaviors in people who practice running [21–27]. Nevertheless, data are limited regarding OP. It has been noted that adult female marathoners tend to consume healthier food when compared to men [28]. We hypothesized that motivation significantly influences diet quality in OP who practice Running. The objective of the present study is to associate motivation with diet quality in OP who practice running.

2. Methods and materials

2.1. Participants

Cross-sectional observational analytical study, which was applied to a probabilistic sample of OP who practice competitive or recreational running in the Metropolitan Region of Chile. Sample size was determined based on the number of OP who participated in the Santiago Marathon in 2018, with a confidence level of 90%, a confidence interval of 10%, and a sample population of 917 subjects. Therefore, the sample size calculated was of 68 participants. Inclusion criteria were OP, Chilean citizens, or foreigners with permanent residence status, who practiced competitive or recreational Running, and fully and correctly answered the research instruments according to the directions. Each subject was applied a survey that included sociodemographic variables and experiences related to the practice of Running. Additionally, two evaluation instruments were applied, whose details are explained below:

2.2. Motivation

Motivation of OP was assessed through the application of the Motivations of Marathoners Scale-34

(MOMS-34), validated in the Spanish population. This scale consists of 34 questions [17], grouped into 4 general categories: (i) Physical health motives, (ii) Achievement motives, (iii) Social motives, and (iv) Psychological motives, which are divided into 7 specific dimensions that examine the reasons to run and measure the degree of motivational orientation to run: Health Orientation, Weight Concern, Personal goal achievement-Competition, Recognition, Affiliation, Psychological Coping, and Life meaning-Self-esteem. Each dimension is measured on a 7-point Likert-type scale, where subjects have to rate motivation to run from least important to most important, with a score ranging from 1 (not a reason to run) to 7 (a very important reason to run), with a mean total score on each scale between 1 (minimum motivation to run) and 7 (maximum motivation to run) [17].

2.3. Food survey

The instrument used for data collection was the survey called Diet Quality Questionnaire for Older People (ECAAM, for its acronym in Spanish) validated in the Chilean population [29]. This consisted of 2 subscales: Healthy dietary habits, and Unhealthy dietary habits. The first subscale, Healthy Dietary Habits, comprises 15 questions, with a minimum score of 1 and a maximum score of 5 per question (Likert-type scale), indicating the frequency of healthy habits and the frequency of consumption of recommended food groups. Each question is scored from non-consumption (1 point) to suggested daily/weekly servings (5 points). A rating is obtained from the total score of the answers of this subscale, ranging from 13 to 65 points (the higher the score, the better the dietary habits). The second subscale, Unhealthy Dietary Habits, comprises 8 questions, with a minimum score of 1 and a maximum score of 5 per question (Likert-type scale) for the 7 first questions, and a minimum score of 1 and a maximum score of 3 for the last question (salt consumption). These subscales deal with foods or food groups identified as non-communicable disease promoters, as well as their frequency. Each question is scored from bad dietary habits (1 point) to non-consumption (3 or 5 points, as appropriate), obtaining a rating from the total answers of this subscale, that varies from 8 to 38 points (the higher the score, the better the dietary habits).

2.4. Rapid assessment of physical activity scale

The Rapid Assessment of Physical Activity Scale (RAPA), this survey is used to determine the level of physical activity of the older people. This questionnaire consists of 2 parts, the first one asking about the performance of aerobic exercise, and the second one asking about the performance of strength and flexibility exercise [30].

2.5. Other variables

In addition, we asked about: Years practicing Running ($\leq$3 years and > 3 years); Training days per week ($\leq$3 days and > 3 days); Training time ($\leq$60 minutes and > 60 minutes); Participates in Team Runnig (Yes / No) and Has a trainer (Yes v/s No), these variables for the adjustments were used dichotomous.

2.6. Ethical aspects of the research

Prior to the start of the interviews, authorization was requested to organizers of diverse sport clubs focused on the practice of running located in the Metropolitan Region of Chile. Each participant signed the informed consent form, the research followed the principles of the Declaration of Helsinki developed by the World Medical Association (World Medical Association, 2018), and was approved by the Scientific Ethics Committee of the Servicio de Salud Metropolitano Oriente (East Metropolitan Health Service, SSMO for its acronym in Spanish).

2.7. Statistical analyses

The characteristics of the studied population are presented as mean and its respective standard deviation for continuous variables, and as percentage for categorical variables. Analytical variables were tested using the Shapiro-Wilk test to evaluate normality of continuous variables. Differences for motivation and diet subscales in women and men were determined by linear regression. All data are presented as means and their respective confidence intervals (95% CI) and beta coefficient (Δ) and its 95% CI. Analyses were adjusted by age, level of education and sex, except when the analyses were stratified. For categorical variables, the Chi-square test was used. The STATA SE v16 software was used for the processing of all data. Significance level was defined as $p < 0.05$.

3. Results

Baseline characteristics are presented in Table 1. Of the total participants ($n = 68$), the majority were men (69.1%), predominant age was 60–69 years (69.1%) and most of them had higher education (63.2%). When compared to men, women had a lower level of education and most of them attended public healthcare facilities (61.9%). Regarding the level of physical activity, they were active (69.1%); and terms of training; they practiced 3 or more days a week (69.1%); and trained 60 or more minutes per session (66.2%) (Table 1).

The characteristics of compliance with dietary guidelines according to sex are shown in Table S1. Women showed a higher proportion in diet quality when compared to men (71.4% vs 36.2%), especially in the compliance of vegetables (66.7% vs 42.6%), fruits (52.4% vs 2.8%), whole grains (81% vs 57.4%), homemade food (95.2% vs 78.7%), water (100% vs 78.7%), number of meals (61.9% vs 34%), and adding salt to food (76.2% vs 48.9%) (Table S1).

The association between motivation and diet overall score is displayed in Table 2. For both sexes, although subjects with healthy diet obtained a better score in most motivation subscales, these were not significant in any of the items.

Table 3 and Table S2 show the association between motivation subscales and food groups. The Weight Concern subscale was associated with pulses (Δ=1.03 (95% CI: 0.10; 1.96), meat (Δ=1.72 (95% CI: 0.51; 2.93), junk food (Δ=1.40 (95% CI: 0.41; 2.39), fried food (Δ=–0.98 (95% CI: –1.94; –0.01) (Table 3), cookies (Δ=1.40 (95% CI: 0.41; 2.39), and coffee (Δ=1.20 (95% CI: 0.21; 2.18) (Table S2). The Personal goal achievement-Competition subscale was associated with meat (Δ=1.25 (95% CI: 0.34; 2.15), alcoholic drinks (Δ=0.80 (95% CI: 0.11; 1.49) (Table 3) and dinner (Δ=0.80 (95% CI: 0.11; 1.49) (Table S2). Recognition was associated with

Table 1
Baseline characteristics of older people who practice running, according to sex

	Men ($n = 47$)	Women ($n = 21$)	Overall ($n = 68$)
Sex			
Men	47 (100%)	0 (0%)	47 (69.1%)
Women	0 (0%)	21 (100%)	21 (30.9%)
Age			
60–69	32 (68.1%)	15 (71.4%)	47 (69.1%)
70 and older	15 (31.9%)	6 (28.6%)	21 (30.9%)
Level of education			
Primary education	6 (12.8%)	3 (14.3%)	9 (13.2%)
Secondary education	8 (17.0%)	8 (38.1%)	16 (23.5%)
Higher education	33 (70.2%)	10 (47.6%)	43 (63.2%)
Healthcare system			
Private	25 (53.1%)	8 (33.0%)	33 (48.5%)
Public	22 (46.8%)	13 (61.9%)	35 (51.5%)
RAPA (part 1)			
Sedentary and Little active	14 (29.8%)	7 (33.3%)	21 (30.9%)
Active	33 (70.2%)	14 (66.7%)	47 (69.1%)
Running time			
≤3 years	4 (8.5%)	1 (4.8%)	5 (7.4%)
>3 years	43 (91.5%)	20 (95.2%)	63 (92.6%)
Week time			
≤3 days	14 (29.8%)	7 (33.3%)	21 (30.9%)
>3 days	33 (70.2%)	14 (66.7%)	47 (69.1%)
Training time			
≤60 minutes	13 (27.7%)	10 (47.6%)	23 (33.8%)
>60 minutes	34 (72.3%)	11 (52.4%)	45 (66.2%)
Team			
Yes	35 (74.5%)	11 (52.4%)	46 (67.6%)
No	12 (25.5%)	10 (47.6%)	22 (32.4%)
Trainer			
Yes	22 (46.8%)	7 (33.3%)	29 (42.6%)
No	25 (53.2%)	14 (66.7%)	39 (57.4%)

Data are presented as number and percentage.

Table 2
Association between motivation to run and diet quality overall score in older people who practice running

Motivation subscales	Diet Score			
	Unhealthy*	Healthy*	Δ 95% CI**	*P*
Overall				
Health orientation	6.09 (5.65; 6.52)	5.80 (5.33; 6.26)	–0.31 (–1.12; 0.50)	0.451
Weight concern	3.76 (3.26; 4.25)	3.79 (3.29; 4.30)	0.09 (–0.91; 1.10)	0.857
Personal goal achievement-competition	5.30 (4.94; 5.65)	5.45 (5.09; 5.81)	0.43 (–0.30; 1.17)	0.243
Recognition	2.78 (2.25; 3.32)	3.63 (3.06; 4.20)	0.65 (–0.30; 1.61)	0.177
Affiliation	4.75 (4.28; 5.22)	4.90 (4.41; 5.40)	–0.43 (–1.19; 0.33)	0.262
Psychological coping	3.99 (3.35; 4.63)	4.20 (3.52; 4.88)	–0.05 (–1.22; 1.12)	0.931
Life meaning-self-esteem	5.85 (5.45; 6.25)	5.98 (5.55; 6.40)	–0.19 (–0.90; 0.51)	0.588
Men				
Health orientation	6.01 (5.47; 6.55)	5.76 (5.05; 6.48)	–0.46 (–1.52; 0.61)	0.389
Weight concern	3.62 (3.07; 4.18)	3.60 (3.02; 4.19)	–0.10 (–1.37; 1.17)	0.878
Personal goal achievement-competition	5.24 (4.83; 5.65)	5.61 (5.18; 6.04)	0.66 (–0.32; 1.64)	0.179
Recognition	2.76 (2.15; 3.37)	4.24 (3.42; 5.05)	0.90 (–0.20; 2.00)	0.104
Affiliation	4.74 (4.19; 5.30)	4.99 (4.26; 5.72)	–0.33 (–1.26; 0.61)	0.480
Psychological coping	3.96 (3.27; 4.64)	4.37 (3.46; 5.29)	0.00 (-1.34; 1.34)	0.997
Life meaning-self-esteem	5.72 (5.25; 6.19)	5.99 (5.37; 6.62)	0.03 (–0.86; 0.92)	0.947
Women				
Health orientation	6.46 (5.68; 7.24)	5.83 (5.34; 6.33)	0.00 (–2.20; 2.20)	0.997
Weight concern	4.26 (3.10; 5.42)	4.07 (3.08; 5.07)	–0.68 (–3.28; 1.92)	0.572
Personal goal achievement-competition	5.43 (4.62; 6.24)	5.33 (4.63; 6.03)	0.25 (–1.91; 2.41)	0.802
Recognition	2.89 (1.60; 4.18)	2.94 (2.13; 3.76)	0.40 (–3.08; 3.88)	0.804
Affiliation	4.78 (3.68; 5.88)	4.80 (4.11; 5.49)	0.67 (–2.21; 3.56)	0.615
Psychological coping	4.17 (2.30; 6.03)	4.00 (2.82; 5.18)	–1.24 (–6.39; 3.91)	0.603
Life meaning-self esteem	6.50 (5.56; 7.44)	5.97 (5.37; 6.56)	–0.83 (–3.13; 1.47)	0.440

*Data presented as mean and their respective 95% confidence intervals. **Data presented as beta coefficient (Δ) and their 95% confidence interval. Linear regression adjusted by sex (overall analysis), age, level of education, RAPA, time running, time week, training time team, and trainer.

meat (Δ=1.44 (95% CI: 0.36; 2.52) (Table 3), and Health Orientation with water (Δ=0.94 (95% CI: 0.02; 1.87) (Table S1).

4. Discussion

The results of this study indicate that motivation is positively associated with diet in OP who practice running, especially for the motivation subscales of Weight Concern, Personal goal achievement-Competition, and Recognition. When making comparisons according to sex, men present more significant associations between motivation and diet quality.

As we identified in a previous investigation, the level of physical activity of these older people was 69.1% Active; which reached 100% in people aged 80 and over; 51.0% carried out activities to increase muscle strength; and 65.0% carried out activities to improve flexibility [20], according to the Rapid Assessment of Physical Activity (RAPA) Scale [31]. Additionally, in terms of training, 69.1% practiced 3 or more days a week; 66.2% trained 60 or more minutes per session; 82.4% have been practicing Running for more than 3 years; 92.6% have made a minimum of 3 runs; 60.6%, 54.5% and/or 48.5% have participated in the 10 K, 21 K and/or 42 K category respectively; and 67.6% participate in a Running Team [20]; coinciding with previous research [32], we can identify that these older people have a high level of physical activity and are very trained.

Dietary guidelines for athletes have been defined by organizations such as the American College of Sports Medicine (ACSM), the International Society of Sports Nutrition (ISSN), and the International Olympic Committee (IOC) [23–25]. Nevertheless, these recommendations are mainly for high-performance athletes, which make them hardly suitable for the population that practice amateur running. Regarding general physically active individuals, the ISSN recommendations are focused on an energy intake ranging from 1800 to 2400 kcals or 25–35 kcals/kg/day for athletes who perform physical activity for 30–40 minutes, 3 or 4 times per week, and 2000–7000 kcals/day or 40–70 kcals/kg/day, which

Table 3
Association between motivation to run and diet quality, according to dietary guidelines for older people who practice running

Motivation subscales	Non-compliance	Compliance	Beta 95% CI	*P*
Pulses				
Health orientation	5.99 (5.53; 6.45)	5.91 (5.47; 6.36)	0.11 (–0.71; 0.93)	0.790
Weight concern	3.38 (2.75; 4.02)	4.14 (3.53; 4.76)	0.60 (–0.47; 1.66)	0.267
Personal goal achievement-competition	5.15 (4.66; 5.64)	5.57 (5.10; 6.05)	0.12 (–0.68; 0.92)	0.763
Recognition	2.87 (2.29; 3.45)	3.48 (2.92; 4.04)	0.06 (–0.92; 1.04)	0.904
Affiliation	4.67 (4.18; 5.16)	4.96 (4.49; 5.44)	–0.33 (–1.09; 0.44)	0.398
Psychological coping	3.88 (3.21; 4.55)	4.29 (3.64; 4.93)	0.08 (–1.10; 1.25)	0.898
Life meaning-self esteem	5.81 (5.39; 6.23)	6.01 (5.60; 6.42)	–0.07 (–0.78; 0.65)	0.852
Meat				
Health orientation	6.28 (5.48; 7.08)	5.89 (5.54; 6.24)	0.72 (–0.17; 1.61)	0.109
Weight concern	2.58 (1.50; 3.65)	4.01 (3.53; 4.48)	–0.33 (–1.31; 0.64)	0.494
Personal goal achievement-competition	4.35 (3.54; 5.15)	5.57 (5.21; 5.92)	1.81 (0.62; 3.00)	**0.004**
Recognition	2.11 (1.15; 3.07)	3.39 (2.97; 3.81)	1.12 (0.22; 2.03)	**0.016**
Affiliation	4.15 (3.33; 4.97)	4.95 (4.59; 5.31)	1.32 (0.21; 2.44)	**0.021**
Psychological coping	4.24 (3.08; 5.40)	4.06 (3.55; 4.57)	0.73 (–0.17; 1.64)	0.108
Life meaning-self esteem	5.77 (5.05; 6.50)	5.94 (5.62; 6.26)	–0.38 (–1.78; 1.01)	0.584
Junk food				
Health orientation	5.82 (5.45; 6.20)	6.25 (5.66; 6.84)	0.50 (–0.29; 1.29)	0.207
Weight concern	3.33 (2.81; 3.84)	4.85 (4.05; 5.65)	1.55 (0.58; 2.52)	**0.002**
Personal goal achievement-competition	5.26 (4.86; 5.66)	5.63 (5.00; 6.25)	0.60 (–0.17; 1.37)	0.124
Recognition	3.03 (2.56; 3.50)	3.55 (2.82; 4.28)	0.77 (–0.16; 1.71)	0.104
Affiliation	4.82 (4.42; 5.23)	4.82 (4.19; 5.44)	0.18 (–0.57; 0.94)	0.628
Psychological coping	3.88 (3.34; 4.43)	4.58 (3.74; 5.43)	0.80 (–0.34; 1.93)	0.164
Life meaning-self esteem	5.89 (5.54; 6.24)	5.97 (5.43; 6.50)	0.08 (–0.62; 0.78)	0.821
Alcoholic drinks				
Health orientation	5.75 (5.34; 6.15)	6.26 (5.76; 6.76)	0.76 (0.02; 1.50)	**0.045**
Weight concern	3.59 (3.01; 4.18)	4.05 (3.32; 4.77)	0.80 (–0.19; 1.79)	0.113
Personal goal achievement-competition	5.04 (4.62; 5.47)	5.86 (5.34; 6.39)	0.72 (–0.01; 1.44)	0.054
Recognition	3.03 (2.51; 3.55)	3.41 (2.77; 4.06)	0.28 (–0.64; 1.20)	0.539
Affiliation	4.54 (4.11; 4.96)	5.25 (4.73; 5.78)	0.57 (–0.14; 1.28)	0.115
Psychological coping	3.90 (3.31; 4.50)	4.37 (3.64; 5.11)	0.71 (–0.38; 1.80)	0.196
Life meaning-self esteem	5.74 (5.37; 6.12)	6.17 (5.71; 6.62)	0.35 (–0.32; 1.01)	0.299
Fried food				
Health orientation	5.99 (5.60; 6.38)	5.86 (5.28; 6.44)	–0.14 (–0.89; 0.60)	0.702
Weight concern	4.08 (3.54; 4.61)	3.10 (2.29; 3.90)	–0.75 (–1.72; 0.21)	0.123
Personal goal achievement-competition	5.38 (4.97; 5.79)	5.34 (4.72; 5.96)	–0.02 (–0.75; 0.71)	0.962
Recognition	3.28 (2.80; 3.77)	2.95 (2.22; 3.68)	–0.20 (–1.09; 0.70)	0.662
Affiliation	4.94 (4.53; 5.34)	4.56 (3.96; 5.17)	–0.30 (–1.00; 0.40)	0.389
Psychological coping	4.09 (3.52; 4.65)	4.10 (3.26; 4.94)	0.10 (–0.98; 1.17)	0.858
Life meaning-self esteem	5.97 (5.62; 6.32)	5.79 (5.26; 6.31)	–0.16 (–0.81; 0.48)	0.615

*Data presented as mean and their respective 95% confidence intervals. **Data presented as beta coefficient and their 95% confidence interval. Linear regression adjusted by sex (overall analysis), age, level of education, RAPA, time running, time week, training time team, and trainer.

is equivalent to 600–1200 kcals or more per hour during exercise for individuals involved in 2–3 hours per day of intense training, 5–6 times per week [24].

With respect to protein requirements, it is recommended an intake of 1.2–2 g/kg/day, which can be found in lean meats, egg whites and skimmed dairy products. A study that compared the nutrient intake of 27 omnivorous, 25 lacto-ovo vegetarian, and 27 vegan recreational runners who trained 2–5 times per week, concluded that the recommended protein intake was exceeded in all three groups, and similar energy intakes were observed; when comparing by sex, men showed higher energy intake than women [33]. In our study, the compliance with the recommendation for fish, eggs, and dairy products was of 83%, 67%, and 36%, respectively.

Regarding dietary fats, the recommended intake is 30% more or slightly higher than the intake advised for non-athletes. In addition, it is recommended that most dietary carbohydrates should come from whole

grains, vegetables, fruits, etc. while foods that empty quickly from the stomach such as refined sugars, starches and engineered sports nutrition products should be reserved for situations in which glycogen resynthesis needs to occur at accelerated rates [24]. In this study, compliance with the recommendation for whole grains was of 64%, for pulses 51%, for vegetables 50%, and for fruits 36%. When analyzing data according to sex, women showed a higher proportion in diet quality, with greater compliance when compared to men in adequate intake of pulses (61.9% vs 46.8%), vegetables (66.7% vs 42.6%), fruits (52.4% vs 2.8%), whole grains (81% vs 57.4%), and eggs (81% vs 61.7%). Few studies have assessed diet quality in OP who practice Running; in a study that included 211 runners of both sexes, participants were classified in sub-groups by type of diet (omnivorous, vegetarian, vegan); compared to male runners, female runners had a significantly greater intake in four food clusters, including "beans and seeds", "fruits and vegetables", "dairy alternatives", and "water". Men reported higher intakes of seven food clusters, including "meat", "fish", "eggs", "oils", "grains", "alcohol", and "processed foods". In general, it was suggested that female runners tend to consume healthier foods than males [28], as in our study, where females also showed a higher proportion in the compliance of the intake of pulses, fruits and vegetables. Other studies conducted with non-athlete OP, that compared diet quality by sex, showed similar results, finding that women followed a healthier diet when compared to men [11, 34].

The intake of foods such as fruits, vegetables, pulses, whole grain cereals, eggs, dairy products, and the reduction or non-consumption of refined sugars and fried foods are part of a healthy dietary pattern [35–37]. Better quality diets are associated with a significantly lower risk of all-cause mortality, cardiovascular disease, cancer, type 2 diabetes, and neurodegenerative diseases, as well as with reduced mortality in cancer survivors [38–41]. Furthermore, and particularly in OP, a better diet quality has been associated with better quality of life [7], reduced risk of decline in physical performance [42], reduced risk of fractures [43], reduced cardiovascular events [44] and reduced cognitive impairment [5, 45].

On the other hand, motivation can modulate behaviors [46], such as performing physical activity or choosing a certain food. Among the motivators associated with the consumption of a food product, we can mention nutritional value, versatility, health benefits, body weight, taste/texture, religion, culture, socialization, cost or agricultural sustainability [47, 48]. Regarding physical exercise, in some cases it has been noted that motivation to exercise has a significant positive correlation with state anxiety and eating disorders [49]. Additionally, a systematic review concluded that the most prevalent motives in adults that perform recreational running were physical health, psychological motives, and personal achievement [50]. In OP, psychological factors such as health concern and social factors significantly affect behavior, perception, preferences, and the purchase of healthy or unhealthy foods [51, 52].

This is one of the first studies that has applied the motivation scale especially adapted to OP who practice running, associating it with diet quality. Results indicate that the Weight Concern motivation subscale has been associated with an adequate consumption of pulses, meat, and coffee, and with a low consumption of junk food, cookies and a greater intake of fried food. Heath Orientation subscale, it was associated with adequate consumption of water. In the case of the Personal goal achievement-Competition subscale, it was associated with an adequate consumption of meat and a low consumption or non-consumption of alcohol. In contrast to the aforementioned results, a study conducted by the National Service for Prevention and Rehabilitation on Drugs and Alcohol Consumption (SENDA, for its acronym in Spanish) examined alcohol consumption in OP and revealed a monthly prevalence of consumption of 42.6% [53]. Alcohol consumption is one of the main risk factors for public health, and even if consumed in small amounts, is a causal factor in more than 200 conditions [54], such as risk of falls [55], cognitive impairment [56], breast cancer [57, 58], and/or sleep disorders [59–61]. The motivation component Personal goal achievement-Competition, related to the participation in a marathon [62] and the influence that alcohol consumption may have on physical performance might explain this association, therefore, OP who practice running have a protective factor regarding the risk of suffering the aforementioned conditions.

As a strength of this research, we can highlight that this is the first study that uses validated surveys for assessing both motivation in OP who practice running and diet quality. Among the weaknesses, the results of this study could not be extrapolated to another population, since the sample was not representative. In addition, it is a cross-sectional study, so it is not possible to determine causality but only to make associations.

On the motivation subscales of Weight Concern, Personal goal achievement-Competition, and Recognition, motivation significantly influences diet quality in OP who practice Running. When comparing by sex, associations are more significant in men. It is necessary to perform more longitudinal studies that assess the association between motivation and diet quality.

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Author contributions

R.U.M, C.A.V, R.C.C: Conceptualization, Methodology, Data curation. S.P.S: Software. B.V.P, S.D.A, R.P.M: Writing- Original draft preparation. R.P.M: Supervision. R.U.M, C.A.V, R.C.C, S.P.S, B.V.P, S.D.A, R.P.M: Writing-Reviewing and Editing.

Conflict of interest

The authors have no conflict of interest to report.

Supplementary material

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References

[1] Albala C. El envejecimiento de la población chilena y los desafíos para la salud y el bienestar de las personas mayores. Rev Med Clin Las Condes. 2020;31:7-12.

[2] United Nations Development Programme. Ageing, Older Persons and the 2030 Agenda for Sustainable Development. [updated 2023 March 10; cited 2023 May 26] Available from: https://www.undp.org/publications/ageing-older-persons-and-2030-agenda-sustainable-development

[3] Instituto Nacional de Estadísticas (INE). Estimaciones y proyecciones de la población de Chile 2002–2035 totales regionales, población urbana y rural. [updated 2023 March 10; cited 2023 May 26] Available from:https://www.ine.cl

[4] WHO. World Health Organization. Global action plan for the prevention and control of NCDs 2013–2020. [updated 2023 April 25; cited 2023 May 26] Available from: https://apps.who.int/iris/bitstream/handle/10665/94384/9789241506236_eng.pdf;jsessionid=A7085FBD8BE799831B1F1837765864DF?sequence=1

[5] Chen X, Maguire B, Brodaty H, O'Leary F. Dietary patterns and cognitive health in older adults: A systematic review. J Alzheimers Dis. 2019;67:583-619.

[6] Font-Jutglà C, Mur Gimeno E, Bort Roig J, Gomes da Silva M, Milà Villarroel R. Effects of mild intensity physical activity on the physical condition of older adults: A systematic review. Rev Esp Geriatr Gerontol. 2020;55:98-106.

[7] Govindaraju T, Sahle BW, McCaffrey TA, McNeil JJ, Owen AJ. Dietary Patterns and Quality of Life in Older Adults: A Systematic Review. Nutrients. 2018;10:971.

[8] Pinheiro MB, Oliveira J, Bauman A, Fairhall N, Kwok W, Sherrington C. Evidence on physical activity and osteoporosis prevention for people aged 65+years: a systematic review to inform the WHO guidelines on physical activity and sedentary behaviour. Int J Behav Nutr Phys Act. 2020; 17:150.

[9] Afshin A, Sur PJ, Fay KA, Cornaby L, Ferrara G, Salama JS, et al. Health effects of dietary risks in 195 countries, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2019;393:1958-72.

[10] Ministerio de Salud. Encuesta Nacional de Salud 2016–2017 Primeros resultados. 2017. [updated 2023 March 10; cited 2023 May 26] Available from: https://www.minsal.cl/wp-content/uploads/2017/11/ENS-2016-17_PRIMEROS-RESULTADOS.pdf

[11] Candía S, Candia P, Mena RP, Durán Agüero S. [Food quality in the elderly population in Santiago of Chile]. Rev Esp Geriatr Gerontol. 2019;54:147-50.

[12] Ministerio del Deporte. Encuesta Nacional de Hábitos de Actividad Física y Deporte 2018 en Población de 18 años y más. 2018. [updated 2023 March 11; cited 2023 May 26] Available from: https://www.mindep.cl/

[13] Aguilar-Chasipanta W, Analuiza-Analuiza E, García-Gaibor J, Rodríguez-Torres A. Los beneficios de la actividad física en el adulto mayor: Revisión sistemática. Polo del Conoc. 2020;5:680-706.

[14] McPhee JS, French DP, Jackson D, Nazroo J, Pendleton N, Degens H. Physical activity in older age: perspectives for healthy ageing and frailty. Biogerontology. 2016;17:567-80.

[15] Ortiz Fernández D, Alzola Tamayo A, Costa Samaniego C, Charchabal Pérez D, Valverde Jumbo L. Actividad física y su impacto en la calidad de vida en adultos mayores ecuatorianos. Correo Cientifico Medico. 2022;26.

[16] Besomi M, Leppe J, Martínez MJ, Enríquez MI, Mauri-Stecca MV, Sizer PS. Running motivations within different populations of Chilean urban runners. Eur J Physiother. 2017;19:8-11.

[17] Ruiz-Juan F, Zarauz Sancho A. [Validation of the Spanish version of the Motivations of Marathoners Scales (MOMS)]. Rev Latinoam Psicol. 2011;43:139-56.

[18] Zarauz Sancho A, Ruiz-Juan F. Motivaciones de los maratonianos según variables socio-demográficas y de entrenamiento. Retos. 2013;24:50-6.
[19] Ruiz-Juan F, Zarauz Sancho A. Análisis de la motivación en corredores de maratón españoles. Rev Latinoam Psicol. 2014;46:1-11.
[20] Avello-Viveros C, Ulloa-Mendoza R, Durán-Aguero S, Carrasco-Castro R, Pizarro-Mena R. Asociación entre nivel de Actividad Física, y Motivación en personas mayores que practican Running. Retos. 2022;46:431-41.
[21] Motevalli M, Wagner KH, Leitzmann C, Tanous D, Wirnitzer G, Knechtle B, et al. Female Endurance Runners Have a Healthier Diet than Males—Results from the NURMI Study (Step 2). Nutrients. 2022;14.
[22] Nebl J, Schuchardt JP, Wasserfurth P, Haufe S, Eigendorf J, Tegtbur U, et al. Characterization, dietary habits and nutritional intake of omnivorous, lacto-ovo vegetarian and vegan runners – A pilot study. BMC Nutr. 2019;5.
[23] Maughan RJ, Burke LM. Practical nutritional recommendations for the athlete. Nestle Nutr Inst Workshop Ser. 2011;69:131-49.
[24] Kerksick CM, Wilborn CD, Roberts MD, Smith-Ryan A, Kleiner SM, Jäger R, et al. ISSN exercise & sports nutrition review update: research & recommendations. J Int Soc Sports Nutr. 2018;15:38.
[25] Thomas DT, Erdman KA, Burke LM. Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and Athletic Performance. J Acad Nutr Diet. 2016;116: 501-28.
[26] Rothschild JA, Kilding AE, Plews DJ. What Should I Eat before Exercise? Pre-Exercise Nutrition and the Response to Endurance Exercise: Current Prospective and Future Directions. Nutrients. 2020;12:3473.
[27] Tiller NB, Roberts JD, Beasley L, Chapman S, Pinto JM, Smith L et al. International Society of Sports Nutrition Position Stand: nutritional considerations for single-stage ultra-marathon training and racing. J Int Soc Sports Nutr. 2019;16:50.
[28] Motevalli M, Wagner KH, Leitzmann C, Tanous D, Wirnitzer G, Knechtle B, Wirnitzer K. Female Endurance Runners Have a Healthier Diet than Males-Results from the NURMI Study (Step 2). Nutrients. 2022 Jun 22;14:2590.
[29] Durán Agüero S, Candia P, Pizarro Mena R. Content validity of Food Quality Survey of Elderly (FQSE). Nutr Hosp. 2017;34:1311-18.
[30] Topolski TD, LoGerfo J, Patrick DL, Williams B, Walwick J, Patrick MB. The Rapid Assessment of Physical Activity (RAPA) among older adults. Prev Chronic Dis. 2006 Oct;3(4):A118.
[31] Pérez C, Bustamante C, Campos S, Sánchez H, Beltrán A, Medina M. Validación de la Escala Rapid Assessment of Physical Activity (RAPA) en población chilena adulta consultante en Atención Primaria. Aquichan. 2015;15: 486-498.
[32] Nakano, T. A Study on Jogging / Running Activities and QOL for the Elderly. Japan Public Health Magazine. 2020;67:211-220.
[33] Nebl J, Schuchardt JP, Wasserfurth P, Haufe S, Eigendorf J, Tegtbur U, et al. Characterization, dietary habits and nutritional intake of omnivorous, lacto-ovo vegetarian and vegan runners - a pilot study. BMC Nutr. 2019;5:51.
[34] Ministerio de Salud. Encuesta nacional de consumo alimentario. 2017. Accessed Mach 11, 2023. https://www.minsal.cl/sites/default/files/ENCA.
[35] Dominguez LJ, Veronese N, Baiamonte E, Guarrera M, Parisi A, Ruffolo C et al. Healthy Aging and Dietary Patterns. Nutrients. 2022;14:889.
[36] Millen BE, Abrams S, Adams-Campbell L, Anderson CA, Brenna JT, Campbell WW, et al. The 2015 Dietary Guidelines Advisory Committee Scientific Report: Development and Major Conclusions. Adv Nutr. 2016;7:438-44.
[37] Neuhouser ML. The importance of healthy dietary patterns in chronic disease prevention. Nutr Res. 2019;70:3-6.
[38] McNaughton SA, Bates CJ, Mishra GD. Diet quality is associated with all-cause mortality in adults aged 65 years and older. J Nutr. 2012;142:320-5.
[39] Salas-Salvadó J, Bulló M, Estruch R, Ros E, Covas MI, Ibarrola-Jurado N, et al. Prevention of diabetes with Mediterranean diets: a subgroup analysis of a randomized trial. Ann Intern Med. 2014;160:1-10.
[40] Schwedhelm C, Boeing H, Hoffmann G, Aleksandrova K, Schwingshackl L. Effect of diet on mortality and cancer recurrence among cancer survivors: a systematic review and meta-analysis of cohort studies. Nutr Rev. 2016;74: 737-48.
[41] Schwingshackl L, Bogensberger B, Hoffmann G. Diet Quality as Assessed by the Healthy Eating Index, Alternate Healthy Eating Index, Dietary Approaches to Stop Hypertension Score, and Health Outcomes: An Updated Systematic Review and Meta-Analysis of Cohort Studies. J Acad Nutr Diet. 2018;118:74-100.e11.
[42] Bloom I, Shand C, Cooper C, Robinson S, Baird J. Diet Quality and Sarcopenia in Older Adults: A Systematic Review. Nutrients. 2018;10:308.
[43] Fabiani R, Naldini G, Chiavarini M. Dietary Patterns in Relation to Low Bone Mineral Density and Fracture Risk: A Systematic Review and Meta-Analysis. Adv Nutr. 2019;10:219-36.
[44] Mohammadifard N, Talaei M, Sadeghi M, Oveisegharan S, Golshahi J, Esmaillzadeh A, Sarrafzadegan N. Dietary patterns and mortality from cardiovascular disease: Isfahan Cohort Study. Eur J Clin Nutr. 2017;71:252-58.
[45] Solfrizzi V, Custodero C, Lozupone M, Imbimbo BP, Valiani V, Agosti P et al. Relationships of Dietary Patterns, Foods, and Micro- and Macronutrients with Alzheimer's Disease and Late-Life Cognitive Disorders: A Systematic Review. J Alzheimers Dis. 2017;59:815-49.
[46] Naranjo ML, Motivación: Perspectivas teóricas y algunas consideraciones de su importancia en el ámbito educativo. 2009;33:153-70.
[47] Doma KM, Farrell EL, Leith-Bailey ER, Soucier VD, Duncan AM. Motivators, Barriers and Other Factors Related to Bean Consumption in Older Adults. J Nutr Gerontol Geriatr. 2019;38:397-413.
[48] Mensah DO, Mintah FO, Oteng SA, Lillywhite R, Oyebode O. 'We're meat, so we need to eat meat to be who we are': Understanding motivations that increase or reduce meat consumption among emerging adults in the University of Ghana food environment. Meat Sci. 2022;193:108927.
[49] Liu Y, Cao Y. The Effect of Exercise Motivation on Eating Disorders in Bodybuilders in Social Networks: The Mediating Role of State Anxiety. Comput Math Methods Med. 2022;2022:7426601.

[50] Pereira HV, Palmeira AL, Encantado J, Marques MM, Santos I, Carraa EV et al. Systematic Review of Psychological and Behavioral Correlates of Recreational Running. Front Psychol. 2021;12:624783.

[51] Bloom I, Lawrence W, Barker M, Baird J, Dennison E, Sayer AA et al. What influences diet quality in older people? A qualitative study among community-dwelling older adults from the Hertfordshire Cohort Study, UK. Public Health Nutr. 2017;20:2685-93.

[52] Caso G, Vecchio R. Factors influencing independent older adults (un)healthy food choices: A systematic review and research agenda. Food Res Int. 2022;158:111476.

[53] SENDA. Estudio uso de alcohol y otras drogas en población de 60 años o más. [updated 2023 Dec 22; cited 2023 May 26] Available from: https://www.senda.gob.cl/principales-resultados-estudio-uso-de-alcohol-y-otras-drogas-en-poblacion-de-60-anos-o-mas/

[54] SENDA-MINSAL. El consumo de alcohol en Chile: Situación epidemiológica. [updated 2023 Dec 22; cited 2023 May 26] Available from: https://www.senda.gob.cl/wp-content/uploads/media/estudios/otrosSENDA/2016_Consumo_Alcohol_Chile.pdf

[55] Heuberger RA. Alcohol and the older adult: a comprehensive review. J Nutr Elder. 2009;28:203-35.

[56] Bates ME, Bowden SC, Barry D. Neurocognitive impairment associated with alcohol use disorders: implications for treatment. Exp Clin Psychopharmacol. 2002;10:193-212.

[57] GBD 2020 Alcohol Collaborators. Population-level risks of alcohol consumption by amount, geography, age, sex, and year: a systematic analysis for the Global Burden of Disease Study 2020. Lancet. 2022;400:185-235.

[58] Liu Y, Nguyen N, Colditz GA. Links between alcohol consumption and breast cancer: a look at the evidence. Womens Health. 2015;11:65-77.

[59] Bain KT. Management of chronic insomnia in elderly persons. Am J Geriatr Pharmacother. 2006;4:168-92.

[60] Chakravorty S, Chaudhary NS, Brower KJ. Alcohol Dependence and Its Relationship With Insomnia and Other Sleep Disorders. Alcohol Clin Exp Res. 2016;40:2271-82.

[61] Stein MD, Friedmann PD. Disturbed sleep and its relationship to alcohol use. Subst Abus. 2005;26:1-13.

[62] Schmidt V, Celsi I, Molina MF, Raimundi MJ, García-Arabehety M, Pérez-Gaido M, et al. Compromiso con el deporte y su relación con el consumo de alcohol en adolescentes y adultos jóvenes. Cuadernos de Psicología del Deporte. 2019;19:24-36.