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EATING HABITS IN RECREATIONAL ATHLETES: A CROSS-SECTIONAL STUDY

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Aim: Physical activity (PA) is an important factor in maintaining health, and combined with a balanced diet, it forms the basis of a healthy lifestyle. A diet not aligned with proper nutritional guidelines and the intensity of PA can affect the body's functioning, hinder recovery after training, and increase the risk of injury. This study examines the PA among recreational athletes and explores their eating habits.

Methods: An observational study was conducted using Metabolic Equivalent Task (MET) minutes/week to determine the level of PA. Dietary data were collected using a Food Frequency Questionnaire (FFQ).

Results: The study involved 62 respondents, categorized into groups of moderately, intensively, and very intensively active recreational athletes and despite recognizing the importance of PA recreational athletes exhibited inadequate dietary habits. Higher intake of fats, cholesterol, and saturated fatty acids was observed, as well as lower intake of carbohydrates than recommended. Most vitamins and some mineral intakes exceeded recommendations. Significant differences between groups were noted only for folate and saturated fatty acid intake.

Conclusion: Nutritional education by professional nutritionists is essential for recreational athletes to correct improper eating habits. The findings of this study can be applied in similar socioeconomic-cultural regions.

Keywords: EATING HABITS, RECREATIONAL ATHLETES, PHYSICAL ACTIVITY, NUTRIENTS

INTRODUCTION

The field of nutrition science began its evolution in the early 20th century, initially focusing on the impact of individual food components on the human body. Over time, researchers recognized the necessity of a holistic approach to understanding the quality of nutrition and its effects on health. It was concluded that overall dietary patterns, rather than isolated nutrient consumption, provide a more accurate nutritional health assessment (1).

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Eating habits represent an individual's overall dietary pattern, including the types and amounts of food consumed and the frequency of consumption (2). When combined with physical activity (PA), proper nutrition forms the cornerstone of a healthy lifestyle, significantly reducing the risk of cardiovascular diseases (3). Sports participation can range from professional-level competitions and training to recreational activities aimed at health improvement or maintenance. Although recreational athletes engage in less intense PA than professionals, their diets must be adjusted to accommodate increased energy expenditure (4).

Recreational athletes often aim to improve physical appearance, enhance fitness, achieve personal sports goals, and enjoy social interactions (4). They often use nutritional supplements to meet these goals and experiment with diets that exclude specific foods or nutrients (3). Unlike professional athletes who typically have access to expert nutritional guidance, recreational athletes often rely on less authoritative sources for dietary advice. Consequently, their diets may lack balance, affecting performance and long-term health (5). This research aimed to determine the activity intensity of recreational athletes and examine their eating habits.

METHODS

Study design

This study was an observational cross-sectional study.

Respondents, settings, and locations

We included adults who are 18 years or older from the area of the city of Split. Research respondents were recruited from sports centers and amateur sports clubs in the metropolitan area of Split. Including criteria were playing sports for at least 3 months and training

at least 2 times a week. The research was conducted from May 18 to July 1, 2020. Professional athletes were not included in the study. Data collection involved anonymous paper-based questionnaires. The research was conducted under GDPR, and the principles outlined in the Declaration of Helsinki.

Variables

The survey used a structured questionnaire divided into two sections. The first section collected data on respondents' characteristics and PA, quantified in Metabolic Equivalent Task (MET) minutes/week. The second section focused on dietary habits using a semi-quantitative food frequency questionnaire (FFQ) with 84 foods and 7 spices. Respondents reported their consumption frequency and portion sizes for the past week, with descriptions provided to aid accuracy. Respondents were also asked about their habits of monitoring their hydration status and access to a nutritionist or dietitian.

Statistical methods

Excel and R programs were used for statistical data processing. The Kolmogorov-Smirnov test was used to test the normality of the distribution. We used descriptive statistics for describing entry variables, following mean and SD. ANOVA tests were used to determine statistically significant differences between groups. We did not use Post hoc analysis because we wanted to observe the whole model difference. P values <0.05 were taken as statistically significant values.

RESULTS

A total of 62 respondents met the inclusion criteria, comprising 25 men and 37 women. The respondents were categorized into three groups based on the intensity of their PA: moderate PA (N=19), intense PA (N=35), and very intense PA (N=8). Demographic data for each participant are included in Table 1 (age: 28,11 ± 6.65 years (mean ± standard deviation)). The results show that the average BMI in women was 22.16 kg/m^2, classifying most female respondents within the normally nourished population. Most of the male respondents belong to the overnourished population with an average BMI of 26.64 kg/m^2.

The respondents with the lowest PA had the highest intake of proteins, fats, and carbohydrates among all three groups. Their average daily energy intake was also the highest with a mean of 2494.24 kcal (SD: 1058.10). The highest alcohol consumption was among the respondents with intense PA with an average of 10.21 g (SD=18.54) (Table 2).

Respondents who engaged in moderate PA consumed a diet largely made up of fats, accounting for an average of 46.3% of their total daily energy intake (SD=4.55). The results of the analysis showed a statistically significant difference in the consumption of saturated fatty acids among the groups of respondents (p=0.007). Respondents engaged in the lowest PA had the highest intake of saturated fats, which made up 15.47% of their total daily energy intake (SD=1.97). Other proportions of nutrients are shown in Table 3.

The group engaging in very intense PA exhibited lower consumption of vitamin A (1693.43 ± 987.94 µg) and vitamin C (95.71 ± 41.37 mg) compared to the other two groups. Conversely, this group had the highest sodium intake, with a mean of 5969.77 mg (SD: 1908.55 mg). There was no statistically significant difference in sodium consumption between the groups of respondents (p=0.992) (Table 4). Most respondents (65%) regularly monitor their hydration status. While only 8% of respondents have access to a dietitian, 66% expressed a positive interest in receiving advice from a nutritionist.

DISCUSSION

Respondents across all three groups reported higher intakes of fats and carbohydrates than those recommended by

Table 1.
Sociodemographic and anthropometric characteristics of the respondents (N=62).

	Gender		Intensity of physical activity		
	Female (n=37) Mean ± SD	Male (n=25) Mean ± SD	Moderate (n=19) Mean ± SD	Intense (n=35) Mean ± SD	Very intense (n=8) Mean ± SD
Age (years)	28.22 ± 6.65	27.96 ± 6.79	29.58 ± 5.35	27.8 ± 7.45	25.75 ± 5.52
Body weight (kg)	64.24 ± 8.31	93.4 ± 10.7	75.98 ± 17.31	77.49 ± 17.20	75.26 ± 16.40
Body height (m)	1.70 ± 0.53	1.88 ± 0.54	1.77 ± 0.10	1.78 ± 0.10	1.77 ± 0.10
BMI (kg/m2)	22.16 ± 2.79	26.64 ± 3.04	23.92 ± 3.63	24.03 ± 3.65	23.82 ± 3.50
Waist circumference (cm)	72.86 ± 8.87	90.45 ± 6.70	77.66 ± 11.60	77.87 ± 11.69	77.77 ± 10.90
Hips circumference (cm)	96.83 ± 6.56	100.64 ± 6.83	97.96 ± 6.82	98.17 ± 6.78	97.84 ± 6.83
MET (min/week)	2241.89 ± 665,31	2499.20 ± 623.44	2298.65 ± 643.24	2319.00 ± 641.92	2332.11 ± 691.93
Smoking N (%)	7 (18,92)	7 (28)	4 (21,05)	8 (22,86)	2 (25)

BMI - Body Mass Index; MET - Metabolic Equivalent Task

Table 2.
Average daily intake of energy and macronutrients among respondents (N=62).

	Level of physical activity			
	Moderate (N=19) Mean ± SD	Intense (N=35) Mean ± SD	Very intense (N=8) Mean ± SD	p - value
Energy value (kcal)	2494.24 ± 1058.10	2235.22 ± 703.38	2263.34 ± 547.29	0.563
Proteins (g)	106.91 ± 58.43	88.16 ± 33.26	93.73 ± 20.96	0.387
Fats (g)	129.05 ± 61.57	108.95 ± 35.82	109.95 ± 32.60	0.336
SFA (g)	43.40 ± 21.04	34.04 ± 14.08	36.49 ± 11.41	0.183
MUFA (g)	50.22 ± 26.39	41.61 ± 13.30	41.32 ± 12.16	0.318
PUFA (g)	24.08 ± 7.88	21.03 ± 6.70	21.49 ± 6.14	0.293
Cholesterol (mg)	306.75 ± 598.08	175.96 ± 103.99	182.64 ± 73.64	0.551
Carbohydrates (g)	215.53 ± 80.25	207.64 ± 66.65	212.79 ± 62.18	0.934
Dietary fibers (g)	23.78 ± 9.53	20.50 ± 5.72	20.04 ± 5.00	0.264
Alcohol (g)	6.14 ± 14.33	10.21 ± 18.54	6.82 ± 10.51	0.648

*p <0.05; SFA - Saturated fatty acids; MUFA - Monounsaturated fatty acids; PUFA - Polyunsaturated fatty acids

dietary guidelines of The World Health Organization (WHO) (6, 7). Fiber intake across all three groups is below the recommended levels. Significantly higher sodium intake than recommended was observed in all three groups. Most respondents expressed a desire for nutritional advice from a dietitian.

The results showed that the average BMI was normal in women and overnourished in men. However, BMI is not always a good indicator of the level of nutrition, especially for athletes. WHO suggests that waist circumference is a significant factor in assessing cardiovascular disease risk. Women with a waist circumference greater than 80 cm and men with a waist circumference greater than 94 cm are at increased risk (8). The average waist circumference of the respondents in our research was below the threshold indicating a generally lower risk among the respondents.

Physical activity is recommended as a preventive measure against chronic non-communicable diseases. Research by Jeong SW et al. indicates that engaging in activities equivalent to 500-1000 MET min/week can reduce the risk of cardiovascular diseases (9). The findings of our study revealed no statistically significant difference in MET between women and men. This contrasts with a study by Boyd et al., which found that male recreational players exhibited significantly higher MET levels than females (10).

In both the moderate and very intense PA groups, approximately two-thirds

Table 3.
The proportion of nutrients in the total daily energy intake among respondents (N=62).

	Level of physical activity			
	Moderate (N=19) Mean ± SD	Intense (N=35) Mean ± SD	Very intense (N=8) Mean ± SD	p - value
Proteins (% kcal)	16.83 ± 2.28	15.58 ± 2.01	16.67 ± 2.33	0.158
Fats (% kcal)	46.30 ± 4.55	43.91 ± 4.11	43.43 ± 5.99	0.097
SFA (% kcal)	15.47 ± 1.97	13.50 ± 2.56	14.32 ± 2.05	0.007*
MUFA (% kcal)	17.89 ± 3.26	16.92 ± 2.83	16.67 ± 2.46	0.454
PUFA (% kcal)	9.11 ± 1.86	8.52 ± 1.24	8.62 ± 1.59	0.388
Cholesterol (% of recommended intake)	920.25 ± 1794.23	527.89 ± 311.96	547.92 ± 220.92	0.551
Carbohydrates (% kcal)	35.10 ± 5.22	37.57 ± 5.82	37.98 ± 7.33	0.209

*p <0.05; SFA - Saturated fatty acids; MUFA - Monounsaturated fatty acids; PUFA - Polyunsaturated fatty acids

Table 4.
Average daily intake of micronutrients among respondents (N=62).

	Level of physical activity			
	Moderate (n=19)	Intense (n=35)	Very intense (n=8)	
	Mean ± SD	Mean ± SD	Mean ± SD	p - value
Retinol (vitamin A mcg)	2116.66 ±1 864.85	2329.43 ± 2377.88	1693.43 ± 987.94	0.744
Vitamin D (mcg)	4.50 ± 5.32	3.40 ± 1.82	3.54 ± 1.58	0.516
Vitamin E (mg)	27.11 ± 14.96	20.99 ± 7.51	21.31 ± 6.67	0.156
Vitamin B1 (mg)	2.08 ± 0.87	1.83 ± 0.61	1.93 ± 0.42	0.732
Vitamin B2 (mg)	3.00 ± 1.64	2.54 ± 1.33	2.42 ± 0.57	0.407
Niacin (mg)	22.50 ± 8.38	22.42 ± 8.38	23.08 ± 4.00	0.984
Vitamin B6	3.86 ± 3.81	3.07 ± 1.80	3.13 ± 0.65	0.544
Folate (mg)	410.84 ± 162.21	306.32 ± 112.29	283.93 ± 82.12	0.012*
Vitamin B12 (mg)	6.44 ± 5.16	4.76 ± 2.70	4.75 ± 1.57	0.266
Vitamin C (mg)	119.07 ± 62.31	110.65 ± 65.85	95.71 ± 41.37	0.609
Na (mg)	5827.56 ± 2407.35	5643.25 ± 1426.14	5969.77 ± 1908.55	0.922
K (mg)	3662.80 ± 1305.94	3197.94 ± 1075.10	3296.17 ± 584.99	0.349
Ca (mg)	1267.06 ± 597.22	970.38 ± 389.30	1020.59 ± 257.68	0.104
P (mg)	1920.72 ± 1003.56	1549.57 ± 616.49	1602.37 ± 365.32	0.264
Mg (mg)	428.04 ± 180.96	352.82 ± 111.10	353.57 ± 76.07	0.168
Fe (mg)	20.29 ± 10.32	19.03 ± 8.24	17.76 ± 2.22	0.752
Zn (mg)	14.79 ± 6.96	12.48 ± 4.75	13.05 ± 2.35	0.403
I (mcg)	75.60 ± 77.54	50.69 ± 25.62	50.43 ± 16.25	0.284
Se (mg)	55.78 ± 86.23	37.53 ± 18.64	38.48± 13.14	0.580

*p <0.05

of respondents reported monitoring their hydration status. Contrastingly, slightly more than half of the respondents engage in hydration monitoring in the intense PA group. This aligns with findings from research conducted by Nuccio et al., which revealed that inadequate hydration is prevalent among athletes, particularly in sports with limited opportunities for fluid replacement (11). Insufficient hydration can significantly impact athletic performance and cognitive function, underscoring the importance of athletes monitoring their hydration status.

The food survey analysis revealed unexpected findings: the group with the lowest PA intensity had the highest average energy intake. Protein intake was notably higher in the moderately active group than in the other two groups of respondents. Such a result contradicts the expectation that the group engaging in the highest intensity of PA would also exhibit the highest protein intake (12).

Carbohydrate intake was found to fall below the recommended levels across all three respondents' groups, with the lowest intake observed among moderately active athletes. This shortfall in carbohydrate consumption can potentially be attributed to their high fat intake, which constitutes nearly half of their daily nutrient intake. Additionally, fiber intake marginally undershoots the recommended 25 g per day across all groups, although moderately active athletes recorded the highest fiber intake (13). This lower fiber consumption may stem from inadequate fruit and vegetable intake, contradicting nutritional guidelines for athletes.

The results show even 5 times higher sodium intake than recommended in all three groups. Such results are concerning since sodium intake is associated with an increased risk of hypertension and cardiovascular disease. Most vitamins and minerals intake are above recommendations, mirroring previous research where dietary supplements led to higher than recommended micronutrient intake (14, 15). This study's high intake of certain micronutrients likely also results from dietary supplements.

Recreational athletes need structured nutritional education to align their dietary habits with their physical activity levels. The involvement of nutritionists can help rectify these discrepancies and enhance overall athletic performance and health. This study identified the most common dietary mistakes among recreational athletes and provided valuable direction promoting the importance of proper nutrition among this group.

Strengths and limitations

The strength of this study is that the study included a diverse group of recreational athletes from various PA levels, providing a broad perspective on dietary habits. Employing both food frequency questionnaires and PA assessments (MET) facilitates a detailed analysis of dietary intake and activity levels. However, a notable limitation is the reliance on self-reported data for dietary intake and PA levels, which may introduce reporting biases. Additionally, the relatively small sample size could restrict the generalizability of the findings to the broader population of recreational athletes.

Recommendations for future research

Future studies in this field would benefit from the implementation of longitudinal designs to assess changes in dietary habits and PA over time, thereby elucidating their long-term impacts on health outcomes. Additionally, there is a need for intervention studies aimed at evaluating the effectiveness of tailored nutritional education programs specifically designed for recreational athletes. To enhance the generalizability of findings, researchers should consider including larger and more diverse sample sizes. Furthermore, the adoption of objective measures for assessing dietary intake and PA is imperative to mitigate potential biases associated with self-reported data. By addressing these methodological considerations, future research endeavors hold the potential to provide more robust and actionable insights into the dietary and PA patterns of recreational athletes.

CONCLUSION

Recreational athletes are aware of the importance of PA in maintaining health, but they need to be further educated about the importance of proper nutrition. In this education, it is necessary to include nutritionists as experts who will point out irregularities in their eating habits and help them plan their diet concerning the intensity of their PA. The findings of this study can be applied in similar socioeconomic-cultural regions.

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LITERATURE

1. Mozaffarian D, Rosenberg I, Uauy R. History of modern nutrition science-implications for current research, dietary guidelines, and food policy. BMJ. 2018 Jun; 13 (361): k2392.
2. Chen Y, Michalak M, Agellon LB. Importance of Nutrients and Nutrient Metabolism on Human Health. Yale J Biol Med. 2018 Jun; 28; 91 (2): 95-103.
3. Desbrow B, Slater G, Cox GR. Sports nutrition for the recreational athlete. Aust J Gen Pract. 2020; 49 (1-2): 17-22.
4. Lorenz DS, Reiman MP, Lehecka BJ, Naylor A. What performance characteristics determine elite versus nonelite athletes in the same sport? Sports Health. 2013; 5 (6): 542-7.
5. Gianfredi V, Nucci D, Ceccarelli F, Villarini M, Moretti M. PILATES (Physical Activity and Diet Survey): An Italian Self-Administered Questionnaire Evaluating Diet Habits of Gym-Goers. Validation Process. J Diet Suppl. 2019; 16 (3): 307-17.
6. Fao/Who (Food and Agriculture Organization/ World Health Organisation). Carbohydrates in human nutrition. Report of a Joint FAO/WHO expert consultation. FAO Food and Nutrition Paper- 66, Rome.
7. FAO/WHO Report of a Joint Expert Consultation on fats and fatty acids in human nutrition. FAO Food and Nutrition Paper 91. Rome: FAO; 2010; 63-77.
8. Garvey WT et al. American Association of Clinical Endocrinologists and American College of Endocrinology Comprehensive Clinical Practice Guidelines for Medical Care of Patients With Obesity. Endocr Pract. 2016 Jul; 22 (3): 1-203.
9. Jeong SW et al. Mortality reduction with physical activity in patients with and without cardiovascular disease. Eur Heart J. 2009 Nov; 40 (43): 3547-55.
10. Boyd CJ et al. Exercise intensity of recreational sport: Impacts of sex and fitness. J Sports Sci Med. 2012 Sep; 11 (3): 562-3.
11. Nuccio RP, Barnes KA, Carter JM, Baker LB. Fluid balance in team sport athletes and effect of hypohydration on cognitive, technical and physical performance. Sports Med. 2017; 47 (10): 1951-82.
12. Šatalić Z, Sorić M, Mišigoj-Duraković M. Sportska prehrana. 1.izd. Zagreb: Znanje; 2016; 157-64.
13. Efsa Panel on Dietetic Products NaA. Scientific opinion on dietary reference values for carbohydrates and dietary fibre. EFSA J 2010; 8: 1462.
14. Tsitsimpikou C, Chrisostomou N, Papalexis P, Tsarouhas K, Tsatsakis A, Jamurtas A. The use of nutritional supplements among recreational athletes in Athens, Greece. Int J Sport Nutr Exerc Metab. 2011; 21 (5): 377-84.
15. Worme JD, Doubt TJ, Singh A, Ryan CJ, Moses FM, Deuster PA. Dietary patterns, gastrointestinal complaints, and nutrition knowledge of recreational triathletes. Am J Clin Nutr. 1990; 51 (4): 690-7.

Sažetak

PREHRAMBENE NAVIKE REKREATIVACA

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Cilj: Tjelesna aktivnost važan je čimbenik očuvanja zdravlja, a u kombinaciji s uravnoteženom prehranom čini temelj zdravog načina života. Prehrana koja nije usklađena s pravilnim prehrambenim smjernicama i intenzitetom tjelesne aktivnosti može utjecati na funkcioniranje tijela, otežati oporavak nakon treninga i povećati rizik od ozljeda. Ova studija ispituje tjelesnu aktivnost kod rekreativnih sportaša i istražuje njihove prehrambene navike.

Metode: Za određivanje tjelesne aktivnosti korišten je MET (eng. Metabolic Equivalent Task) minuta/tjedan. Podaci o prehrambenim navikama prikupljeni su pomoću upitnika o učestalosti unosa hrane (engl. Food frequency questionnaire, FFQ).

Rezultati: U istraživanju je sudjelovalo 62 ispitanika, kategoriziranih u skupine umjereno, intenzivno i vrlo intenzivno aktivnih rekreativaca. Unatoč prepoznavanju važnosti tjelesne aktivnosti rekreativci su pokazali neadekvatne prehrambene navike. Uočen je veći unos masti, kolesterola i zasićenih masnih kiselina, kao i manji unos ugljikohidrata od preporučenog. Unosi većine vitamina i nekih minerala premašili su preporučene. Značajne razlike između skupina primijećene su samo za unos folata i zasićenih masnih kiselina.

Zaključak: Edukacija o pravilnoj prehrani, pod vodstvom nutricionista, neophodna je kako bi rekreativci ispravili svoje nepravilne prehrambene navike. Nalazi ove studije mogu se primjeniti u sličnim socioekonomsko - kulturološkim regijama.

Ključne riječi: HRANJIVE TVARI, PREHRAMBENE NAVIKE, REKREATIVNI SPORTAŠI, TJELESNA AKTIVNOST

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