

## **Comparison of Dietary Macro and Micro-Nutrients According to Gender in Recreationally Physically Active Youth**

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### **Abstract**

This study aimed to compare dietary macro and micronutrient intake between genders in recreationally physically active young males and females. A total of 60 volunteers participated in the study. (mean age of males: 22.09±2.45 years; mean age of females: 19.96±2.91 years). During the study period, participants were instructed to continue their usual eating habits and to provide a three-day dietary record consisting of two weekdays and one weekend day. The average intake of energy, macronutrients, and selected micronutrients (vitamins C, A, and E) was calculated from the dietary records using a computerized dietary analysis software (BEBIS, version 6.1, Turkey). A statistically significant difference was observed between males and females in terms of daily energy (kcal/day) and protein (g) intake, with higher values reported in males (1568.5±418.9 vs. 1356.3±254.9; 71.0±19.10 vs. 56.55±16.10, respectively), but no gender differences were found when protein intake was expressed as a percentage. Additionally, no significant gender differences were identified in fat, carbohydrate, or cholesterol intake. Furthermore, except for vitamin B6 and phosphorus, the intake of the remaining vitamins and minerals assessed (A, E, C, B1, B2; Na, K, Ca, Mg, P, Fe, and Zn) did not differ significantly. Consequently, men have consumed significantly higher amounts of certain nutrients compared with women. Nevertheless, several key vitamins and minerals have been determined below the Population Reference Intake (PRI) in both genders.

**Keywords:** Food intake, Nutrient, Male, Female

## Introduction

Healthy nutrition can be defined as the balanced and appropriate consumption of nutrients to support growth and development, sustain life, maintain or improve the current health status, and improve the quality of life (Sankhya et al., 2024). Nutrients are compounds necessary for the body to sustain its physiological processes and are basically divided into two main categories as macronutrients and micronutrients (Cena & Calder, 2020; Faizan & Rouster, 2023). Macronutrients consist of proteins, carbohydrates, and fats, while micronutrients include vitamins and minerals (Matthewman & Costa-Pinto, 2023). Macronutrients and micronutrients work together to meet healthy nutritional intake and nutritional needs. While a balanced macronutrient intake meets the body's energy needs, vitamins and minerals also ensure the proper functioning of biological functions. However, each individual's nutritional requirements vary depending on many factors, such as age, gender, body weight, physical activity level and general health status (Gush, Shah & Gilani, 2021). In addition, nutrient intakes preferences may vary depending on dietary habits, economic status, emotional state, diseases and appetite, living conditions and psychosocial factors (stress, work conditions, family support) (Demory-Luce et al., 2004; Nicklas et al., 2001).

Nutritional habits are an important component that directly affects human health (Pekcan, 2008). The nutritional status of an individual indicates the extent to which nutrient requirements are met and it is important to ensure the balance between nutrient intake and requirement for optimal health. Inadequate or excessive consumption in terms of nutrition plays an important role in increasing health problems and mortality rates. In this context, accurate assessment of the nutritional status of individuals and prevention of nutritional problems that impair the quality of life are important in terms of improving both personal and social health. Considering the impact of regular physical activity and adequate and balanced nutrition habits on health, these two lifestyles' behaviors are the main factors reducing the risk of various chronic diseases such as type 2 diabetes, cardiovascular diseases, obesity, etc. (Singh et al., 2008; Telama, 2009).

It is noted that physical activity is associated with a better nutritional intake (Csizmadi et al., 2014; Cao et al., 2012; Carlson et al., 2012). The effects of gender on physical activity levels and related dietary preferences, especially among young people, is an important research area in the health and sports sciences literature. While men generally follow nutritional strategies to gain more muscle mass and strength through higher energy and protein intakes, women may prefer generally lower calorie diets for body composition, weight loss and aesthetic goals. It is stated that this situation poses a higher risk for health problems such as anaemia and osteoporosis in women than in men (Horacek et al., 2002). Gender differences such as genetic structure, sex hormones, and menstrual cycle may show significant differences between the sexes to maintain physiological internal body balance in males and females (Marino et al., 2011). Gender-specific differences can significantly affect the physiological response to exercise and nutrition by creating different effects on nutrient intake and nutrient bioavailability, metabolism, distribution, and excretion in males and females (Madigan, 2024). In this context, it is important to investigate the relationships between gender and the two most important lifestyle behaviors that affect energy balance and quality of life: nutritional habits and physical activity behavior. Unlike the literature that focuses solely on elite athletes, this study examines gender-based differences in macro and micronutrient intake among 'recreationally physically active' young people who do not receive

professional support. Hence, this study aimed to investigate the effects of gender differences on macro and micronutrient intakes in recreationally physically active young individuals.

## Material and Method

**Ethics committee permission:** The study was conducted in accordance with the ethical guidelines of the 1975 Declaration of Helsinki and received approval from the corresponding University Institutional Review Board (Decision number: E-87914409-050.04-71271).

## Participants

Recreationally physically active young, volunteered males ( $n=35$ ; mean age:  $22.09\pm 2.45$  years) and females ( $n=25$ ; mean age:  $19.96\pm 2.91$  years) participated in the study. Demographic data for the male and female participants have been presented in Table 1. The primary inclusion criteria were having general good health, engaging in recreational physical activities such as tracking, hiking and jogging. All participants enrolled in a specific sports area in city centre, additionally, the information about physical activity participation was collected through verbal declarations. Participants presenting with medical, cardiovascular, metabolic, or respiratory diseases were excluded from the study. Additionally, participants on special diets and taking nutritional supplements were excluded from the study.

Prior to data collection, all participants were fully informed about the study's potential benefits and risks and were assured of their right to withdraw from the study at any time. Written consent forms were obtained from the participants or (if necessary) their parents; eight participants were under 18 years old (two of them were 16 years old (%3.3), and six of them were 17 years old (%10)).

## Procedure

The study was conducted in two parts; first, the anthropometric measurements were collected according to the standard protocols, second, the diet recall forms were completed, and nutrition intakes were determined.

## Anthropometric Measurements

Participants' heights (cm) were measured using a portable stadiometer (Tartı, Turkey) to the nearest 0.1 cm. Additionally, participants' weights (kg) were determined using digital scale (Seca 767) to the nearest 0.2 kg. Each measurement was performed twice, with the average of the two values taken as the final result.

## Dietary Analysis

Participants were asked to preserve their normal eating patterns during the study, and their nutrient intake was evaluated based on three-day 24-hour diet records, consisting of two weekdays and one weekend day. The diet record forms were used to record the type and amount of all food and beverages consumed throughout the days (Dost & Esin, 2022). Following that, to quantify the average intake of calories, protein, carbohydrate, fat, vitamin C, vitamin A, vitamin E, etc. a computerized dietary assessment program (BEBİS, version 6.1, Turkey) was used. Additionally, a coloured nutritional atlas representing the portion sizes of various servings were also used to make the analysis more accurate. In this study, the Goldberg Cut-off or a similar energy intake verification method was not used to test the reliability of participants' energy intake reports.

## Statistical Analysis

All values were expressed as the mean ± standard deviation (SD). Comparison with the Adequate Intake (AI), Population Reference Intakes (PRI) or Average Requirement (AR) were made according to the Turkish Nutrition Guidelines (TÜBER, 2022) published by the Ministry of Health in 2022. According to the TÜBER (2022), the PRI values defined by the European Food Safety Authority (EFSA), which are considered to meet the nutrient needs of 97.5% of healthy individuals, were used as the basis. PRI is functionally and statistically equivalent to the Population Reference Intakes (PRI) value, which is widely used in the literature.

The data were assessed for the normal distribution with the Kolmogorov-Smirnov test. Since the data was not normally distributed, Mann Whitney U tests were performed to determine gender differences for examined variables. Statistical analyses were performed using version 23 of SPSS (Statistical Package for Social Sciences, SPSS Inc.) for Windows and  $p < 0.05$  was accepted as statistically significant. Additionally, the effect sizes (ES) were calculated as the “r” using the formula  $r = |Z| / \text{square root}(n_A + n_B)$  where the  $n_A + n_B$  was the sum of the participants, and classified as 0.1 = small effect, 0.3 = medium effect, and 0.5 = large effect. When the  $p < 0.05$ , the ES was reported and interpreted with the relevant variable in the discussion section.

### Findings

The participants’ descriptive data is reported in Table 1, additionally, the macro nutrients’ mean values are presented in Table 2. The data of vitamins and minerals are reported in Table 3 and 4, respectively.

**Table 1.** Descriptive characteristics of the study population (mean ± SD)

	Male (n=35)	Female (n=25)
Age (years)	22.09 ± 2.45	19.96 ± 2.91**
Height (cm)	179.88 ± 4.30	164.76 ± 5.13**
Body weight (kg)	80.85 ± 13.4	59.12 ± 5.96**

\*\*  $p < 0.01$  significantly different

The findings of the current study showed that the male group had significantly greater mean standing height (cm), and body weight (kg) compared with the female group (Table 1).

**Table 2.** The mean values of dietary macro nutrients (mean ± SD)

	Male	Female	p	PRI / AI / AR
Energy (kcal/day)	1568.45 ± 418.86	1356.28 ± 254.86	0.027	2239 – 2558 (M) AR* 1786 – 2041 (F) AR*
Protein (g)	71.09 ± 19.10	56.55 ± 16.10	0.003	-----
Protein (g/kg)	1.18 ± 0.26	1.17 ± 0.63	0.124	0.83 (M and F) PRI 1.04 (M and F) AR
Protein (%)	18.94 ± 4.08	17.36 ± 5.05	0.185	10-20
Fat (g)	62.70 ± 21.10	52.61 ± 10.65	0.058	-----
Fat (%)	35.48 ± 6.50	34.88 ± 5.33	0.752	20-35
Carbohydrate (g)	174.14 ± 54.68	160.31 ± 45.85	0.380	-----
Carbohydrate (%)	45.22 ± 7.28	47.80 ± 7.04	0.177	45-60

<b>Cholesterol (g)</b>	0.270 ± 0.132	0.222 ± 0.111	0.180	-----
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PRI: Population Reference Intakes; AI: Adequate Intake; AR: Average Requirement, \* values reported for less active and more active, respectively according to physical activity level; M: male; F: female.

The results demonstrated that there were significant differences between male and female participants for intake of calories (kcal/day) ( $1.568 \pm 0.418$  vs  $1.356 \pm 0.254$ , respectively;  $p=0.027$ ) and protein (g) ( $71.09 \pm 19$  vs  $56.66 \pm 16$ , respectively;  $p=0.003$ ). On the other hand, when protein was expressed as %, and g/kg there were no differences between sexes ( $p>0.05$ ). No significant differences were observed between groups for fat (g, %), carbohydrate (g, %), and cholesterol (g) amount ( $p>0.05$ ).

**Table 3.** The mean values of vitamin intake through diet (mean ± SD)

	Male	Female	p	PRI / AI
<b>Vitamin A (µg)</b>	1113.1 ± 1560	741.63 ± 389	0.910	750 (M) 650 (F)
<b>Retinol (µg)</b>	503.27 ± 1224	287.32 ± 112	0.851	900 (M) 700 (F)
<b>Carotene (mg)</b>	2.27 ± 2.48	1.83 ± 0.97	0.958	-----
<b>Vitamin E equivalent (mg)</b>	12.06 ± 5.99	10.70 ± 5.33	0.264	13 (M) 11 (F)
<b>B1 (mg)</b>	0.71 ± 0.20	0.61 ± 0.16	0.069	0.4 (M and F)
<b>B2 (mg)</b>	1.14 ± 0.47	0.95 ± 0.21	0.092	1.6 (M and F)
<b>B6 (mg)</b>	1.35 ± 0.48	1.21 ± 0.81	0.024	1.7 (M) 1.6 (F)
<b>Folic acid (µg)</b>	215.86 ± 63.38	193.04 ± 39.89	0.284	330 (M and F)
<b>Vitamin C (mg)</b>	64.85 ± 31.12	62.04 ± 34.21	0.564	110 (M) 95 (F)

PRI: Population Reference Intakes; AI: Adequate Intake; M: male; F: female

There were no significant differences between the groups for any of the vitamins assessed (vitamin A, B1, B2, C, E, retinol, carotene, and folic acid ( $p>0.05$ ); Table 3), except vitamin B6 ( $1.35 \pm 0.48$  (mg) recorded for males, vs.  $1.21 \pm 0.81$  (mg) recorded for females;  $p=0.024$ ; Table 3).

**Table 4.** The mean values of mineral intake through diet (mean ± SD)

	Males	Females	p	PRI/AI
<b>Sodium (mg)</b>	3586.29 ± 1351	3501.00 ± 1743	0.626	2000
<b>Potassium (mg)</b>	1899.81 ± 462	1742.64 ± 458	0.190	3500
<b>Calcium (mg)</b>	542.35 ± 155	510.24 ± 129	0.277	1000
<b>Magnesium (mg)</b>	228.36 ± 54.4	207.82 ± 55.4	0.124	350 (M) 300 (F)
<b>Phosphor (mg)</b>	1023.14 ± 228	884.43 ± 192	0.021	550

<b>Iron (mg)</b>	9.85 ± 2.94	8.71 ± 1.97	0.156	11(M) 16 (F)
<b>Zinc (mg)</b>	9.05 ± 3.19	7.57 ± 1.76	0.055	9.4-16.3 (M) 7.5-12.7 (F)

AI: Adequate Intake; PRI: Population Reference Intakes; M: male; F: female.

The results showed; that except phosphorus ( $\mu\text{g}$ ) ( $p=0.021$ ), no significant differences were observed for examined minerals contents between male and female groups (Na ( $\mu\text{g}$ ), K ( $\mu\text{g}$ ), Ca (mg), Mg (mg), Fe (mg), and Zn (mg),  $p>0.05$ ; Table 4).

### Discussion and Conclusion

The current study compared dietary macro and micronutrients between gender in recreationally physically active young individuals. The findings of the current study showed no significant differences between gender in terms of macro and micronutrient intake, except the total energy (kcal/day), protein (g), vitamin B6 (mg), and phosphor (mg) amount which were higher in males.

Energy intake is necessary for the proper functioning of critical biological mechanisms such as metabolism, cellular functions, brain functions, physical activity and muscle functions, thermoregulation, hormonal regulation, and the immune system (Mougios, 2020). When the findings of the current study are examined, it is seen that the energy intake value of males was significantly higher than females ( $p = 0.027$ ; ES  $r = 0.29$ ), and intake values (kcal/day) were well below the AR recommendations. In both gender, energy intake is below the limit required for the body to maintain basic functions after energy expenditure for exercise. This finding is a striking result showing that recreationally physically active youth are unaware of the 'composition' of the foods they consume and 'the need for adequate energy intake'. Consistent with the current study findings, Lökbaş et al. (2020) investigated the nutritional status and energy balance in ice hockey players and reported higher energy intake for male than the female players ( $1987 \pm 220$  kcal/day vs  $1715 \pm 259$  kcal/day, respectively). Even though the players were determined as professional ice hockey players in the mentioned study, the amount of energy intake values have been lower than the AR recommendations (Lökbaş et al., 2020). This situation can be explained by the fact that athletes cannot meet their daily energy requirements and as a result an energy deficit occurs.

In the current study, differently from the energy intake data macronutrients' consumption, such as protein, fat, and carbohydrates, have been determined within normal limits. The mean protein intake value of males was significantly higher than females ( $p = 0.003$ ; ES  $r = 0.39$ ). The medium  $r$  value ( $r=0.39$ ) determined for protein intake means in practical that gender is important for protein intake, independent of sample size. Men's significantly higher protein consumption can probably be attributed to societal eating habits or a more prevalent awareness among men of the relationship between muscle mass and protein. Although our findings show that men have higher calorie and protein intake than women, the similarity in protein amounts in g/kg indicates that both genders meet similar relative protein needs. However, it is noteworthy that total energy intake (approximately 1356 kcal in women, approximately 1568 kcal in men) is significantly below the average (estimated) energy requirements (AR) reported in the literature for young people leading active lives. This low energy intake may increase the risk of 'Low Energy Availability', especially in female participants, potentially leading to hormonal imbalances, impaired bone health, and weakened immune systems in the long term.

Consistent with the findings of the current study (Table 2), protein consumption of male players ( $113.66 \pm 18.78$  g/day) was found to be significantly higher than female players ( $95.49 \pm 17.33$  g/day), but when the protein was expressed as g/kg/day the significant differences were not observed (Lökbaş et al., 2020). Li et al., (2012) reported that university male students consumed a higher percentage of energy from fat than female students (32.4 (5.2) vs. (30.5 (4.6), respectively;  $p < .001$ ). This is explained with more healthful eating habits of female students that led to a higher consumption of fiber and fruits and vegetables, as well as a lower percentage of energy from fat (Li et al., 2012). In the current study no significant differences were observed for fat intake (g, %) between gender.

Comparison the vitamin consumption between gender shows that mean values for all examined vitamins are higher in males (Table 3). A significant difference was determined between gender for vitamin B6 (mg) ( $p = 0.024$ ; ES  $r = 0.29$ ). An effect size of 0.29 indicates a small-to-medium (or weak-to-moderate) effect, meaning the observed difference is noticeable but not large. It is seen that vitamin consumption is lower than PRI values in many aspects (e.g; vitamin B1, B2, B6, C, and retinol). The reason for this situation may be an inadequate diet or an inadequate absorption of this vitamin in the body. Vitamins act as catalysts or cofactors in chemical reactions. Many vitamin groups are involved in metabolic processes such as energy production, for example vitamin B1 is important by acting as a coenzyme in the Krebs cycle and electron transport chain, (Mrowicka et al., 2023), and vitamin B2 is involved in the formation of flavin adenine dinucleotide (FAD) (Kenney et al., 2022). Vitamin B6 is important for red blood cell production, carbohydrate metabolism, liver detoxification, brain and nervous system health (Qian et al., 2017; Stach et al., 2021). Vitamin C is necessary to produce collagen, and synthesize some hormones such as anti-inflammatory corticoids, and iron absorption (Kenney et al., 2022). Vitamin A supports inflammatory systems, cell growth and development, and has antioxidant properties (Kenney et al., 2022). In summary, vitamins serve numerous functions in the body for normal growth and development. Therefore, it is important to take vitamins with diet and monitor them.

Similar to the findings related to the vitamins, the mean values of mineral are found to be higher in males compared to the females (Table 4); significant difference was found for phosphorus levels (mg) between gender ( $p = 0.021$ ; ES  $r = 0.30$ ). Compatible with the current findings, in a study conducted on active ice hockey players reported significant lower phosphorus level in females' players than males' ones ( $1357 \pm 243,71$  mg/day vs.  $1606 \pm 296,07$  mg/day respectively;  $p < 0.05$ ) (Lökbaş et al., 2020). The fact that men have more muscle mass, consume high calories and hormonal differences may indirectly affect the use of phosphorus. Phosphate plays an important role in different biochemical reactions mostly related to ATP production and the formation of DNA/RNA building blocks, while calcium plays a role in muscle contractions, nerve conduction, blood clotting, and intracellular signalling (Takeda et al., 2014). The form of calcium phosphate is the main structural components of bones, thus ensuring their hardness and durability which prevent the osteoporosis (Berndt & Kumar, 2009; Takeda et al., 2014). In the current study an effect size of 0.30 reported for phosphorus indicates medium effect, representing a modest, often subtle, difference between groups. The clinical implication for the female group should be monitored in terms of bone mineral density risk when combined with low energy intake. The overall low mineral intake suggests that recreationally active young people may be at risk of 'micronutrient deficiency'. However, the sodium intake is higher than the adequate intake values in both genders. High sodium intake is associated with high blood pressure, increased

risk of stroke and cardiovascular disease (Strazzullo et al., 2009), additionally, low potassium intake may increase the risk of hypertension (Udensi & Tchounwou, 2017).

The findings of studies regarding gender differences in terms of macro and micronutrient intakes are contradictory. A study conducted by Ahn et al., (2021) investigated differences in nutrient intake and diet quality between gender and age groups. In this study, it was observed that vitamin A and C intake was higher in women. Significant differences were reported between genders in energy intake and all macro-micronutrient intakes (except vitamin A). Similarly, Mirmiran et al., (2003) reported significant gender differences for average daily intakes of energy, protein, carbohydrate, fat, fiber, cholesterol, iron, calcium, and phosphorus. On the other hand there is study reported no significant differences between gender (Ratsavong et al., 2020).

When the study findings are examined, it is striking that inadequate macro and micronutrient intake is more common in women than in men. These findings show that dietary intakes are largely similar by gender, but there are gender differences in phosphorus and B6 values, and women have lower nutrient intake. These findings are consistent with the findings of previous studies in low- and middle-income countries (Huang et al., 2005; Ahn et al., 2021).

When interpreting the results of the current study, it is important to acknowledge several limitations. Primarily, the small sample size; even though the priori sample size was performed the target number of participants could not be reached. The participants were in a narrow age-range and enrolled in a specific sports area in city centre, for this reason, the age variable was not assigned as a covariate in the analyses, additionally, physical activity was not quantitatively determined using objective methods such as accelerometers or questionnaires (IPAQ, etc.), the information about physical activity participation was collected through verbal declarations. The Goldberg Cut-off or a similar energy intake verification method was not used to test the reliability of participants' energy intake reports. Participants did not vary widely in age, for this reason, it should be considered that these findings could not be generalized for different aged groups. Finally, the nutrient data were all self-reported, therefore, this may have affected the results. The mentioned limitations are recommended to be considered in future studies.

Consequently, it was determined that there was a significant difference in food intake in favour of men in terms of some nutrients. Our findings, which show macronutrient and micronutrient intakes far below the PRI values, indicate that a "Low Energy Availability" pattern is prevalent among recreationally active youth. Energy intake values, around 1500 kcal, reflect the reality of 'unconscious malnutrition' frequently observed among recreationally active individuals. This low intake level is one of the most important findings of our study and highlights the urgency of professional follow-up on nutrition for active young people. In order to optimize nutritional awareness and physiological health in a recreationally active young population, addressing deficiencies in energy availability through a multidisciplinary approach is crucial. In this context, periodic monitoring of individuals with regular biochemical analyses for macro and micronutrients, provision of individualized nutritional counseling, and support with digital tracking platforms are considered strategic necessities.

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## REFERENCES

- Ahn, Y., Lee, Y., Park, H., & Song, K. (2021). Gender and age group differences in nutrition intake and dietary quality of Korean adults eating alone: based on Korean National Health and Nutrition Examination Survey Data, 2013–2016. *Nutrition Research and Practice*, 15(1), 66-79.
- Berndt, T., & Kumar, R. (2009). Novel mechanisms in the regulation of phosphorus homeostasis. *Physiology*, 24(1), 17-25.
- Cao, Z. B., Sasaki, A., Oh, T., Miyatake, N., Tsushita, K., Higuchi, M., ... & Tabata, I. (2012). Association between dietary intake of micronutrients and cardiorespiratory fitness in Japanese men. *Journal of Nutritional Science*, 1, e12.
- Carlson, J. A., Sallis, J. F., Ramirez, E. R., Patrick, K., & Norman, G. J. (2012). Physical activity and dietary behavior change in Internet-based weight loss interventions: comparing two multiple-behavior change indices. *Preventive Medicine*, 54(1), 50-54.
- Cena, H., & Calder, P. C. (2020). Defining a healthy diet: evidence for the role of contemporary dietary patterns in health and disease. *Nutrients*, 12(2), 334.
- Csizmadi, I., Kelemen, L. E., Speidel, T., Yuan, Y., Dale, L. C., Friedenreich, C. M., & Robson, P. J. (2014). Are physical activity levels linked to nutrient adequacy? Implications for cancer risk. *Nutrition and Cancer*, 66(2), 214-224.
- Demory-Luce, D., Morales, M., Nicklas, T., Baranowski, T., Zakeri, I., & Berenson, G. (2004). Changes in food group consumption patterns from childhood to young adulthood: the Bogalusa Heart Study. *Journal of the American Dietetic Association*, 104(11), 1684-1691.
- Dost, A., & Esin, M. N. (2022). Effects of the UNI-PAHNP on physical activity and nutrition behaviors in overweight/obese university students in Turkey. *Perspectives in Psychiatric Care*, 58(4), 2003-2016.
- Faizan, U., & Rouster, A. S. (2023). Nutrition and hydration requirements in children and adults. In *StatPearls* [Internet]. StatPearls Publishing.
- Gush, L., Shah, S., & Gilani, F. (2021). Macronutrients and micronutrients. In *A prescription for healthy living* (pp. 255-273). Academic Press.
- Horacek, T. M., White, A., Betts, N. M., Hoerr, S., Georgiou, C., Nitzke, S., & GREENE, G. (2002). Self-efficacy, perceived benefits, and weight satisfaction discriminate among stages of change for fruit and vegetable intakes for young men and women. *Journal of the American Dietetic Association*, 102(10), 1466-1470.
- Huang, T. T. K., Roberts, S. B., Howarth, N. C., & McCrory, M. A. (2005). Effect of screening out implausible energy intake reports on relationships between diet and BMI. *Obesity Research*, 13(7), 1205-1217.

Kenney, W. L., Wilmore, J. H., & Costill, D. L. (2022). Physiology of sport and exercise. Human Kinetics.

Li, K. K., Concepcion, R. Y., Lee, H., Cardinal, B. J., Ebbeck, V., Woekel, E., & Readdy, R. T. (2012). An examination of sex differences in relation to the eating habits and nutrient intakes of university students. *Journal of Nutrition Education and Behavior*, 44(3), 246-250.

Lökbaş, B., Aktitiz, S., Koşar, N., & Turnagöl, H. (2020). Assessment of Professional Ice Hockey Players' Nutritional Status and Energy Balance During Competition Period. *Hacettepe Journal of Sport Sciences*, 31(3), 140-151.

Madigan, S. M. (2024). Sex and gender in sports nutrition research: bridging the gap. *Proceedings of the Nutrition Society*, 83(4), 229-235.

Marino, M., Masella, R., Bulzomi, P., Campesi, I., Malorni, W., & Franconi, F. (2011). Nutrition and human health from a sex-gender perspective. *Molecular Aspects of Medicine*, 32(1), 1-70.

Matthewman, M. C., & Costa-Pinto, R. (2023). Macronutrients, minerals, vitamins and energy. *Anaesthesia & Intensive Care Medicine*, 24(2), 134-138.

Mirmiran, P., Mohammadi, F., Sarbazi, N., Allahverdian, S., & Azizi, F. (2003). Gender differences in dietary intakes, anthropometric measurements and biochemical indices in an urban adult population: the Tehran Lipid and Glucose Study. *Nutrition, Metabolism and Cardiovascular Diseases*, 13(2), 64-71.

Mougiou, V. (2020). Exercise biochemistry. Human Kinetics Publishers.

Mrowicka, M., Mrowicki, J., Dragan, G., & Majsterek, I. (2023). The importance of thiamine (vitamin B1) in humans. *Bioscience Reports*, 43(10).

Nicklas, T. A., Baranowski, T., Baranowski, J. C., Cullen, K., Rittenberry, L., & Olvera, N. (2001). Family and child-care provider influences on preschool children's fruit, juice, and vegetable consumption. *Nutrition Reviews*, 59(7), 224-235.

Pekcan, G. (2008). Beslenme durumunun saptanması. *Diyet El Kitabı*, 726, 67-141.

Qian, B., Shen, S., Zhang, J., & Jing, P. (2017). Effects of vitamin B6 deficiency on the composition and functional potential of T cell populations. *Journal of Immunology Research*, 2017(1), 2197975.

Ratsavong, K., van Elsacker, T., Doungvichit, D., Siengsounthone, L., Kounnavong, S., & Essink, D. (2020). Are dietary intake and nutritional status influenced by gender? The pattern of dietary intake in Lao PDR: a developing country. *Nutrition Journal*, 19, 1-16.

Sankhya, T. A. S., Bandaru, L. H., Srivaralakshmi, T., & Rao, P. S. (2024). Impact and Significance of Nutritional Attitude Assessment: A Review. *Journal of Clinical and Pharmaceutical Research*, 5-7.

Singh, A. S., Mulder, C., Twisk, J. W., Van Mechelen, W., & Chinapaw, M. J. (2008). Tracking of childhood overweight into adulthood: a systematic review of the literature. *Obesity Reviews*, 9(5), 474-488.

Stach, K., Stach, W., & Augoff, K. (2021). Vitamin B6 in health and disease. *Nutrients*, 13(9), 3229.

Strazzullo, P., D'Elia, L., Kandala, N. B., & Cappuccio, F. P. (2009). Salt intake, stroke, and cardiovascular disease: meta-analysis of prospective studies. *BMJ*, 339.

Takeda, E., Yamamoto, H., Yamanaka-Okumura, H., & Taketani, Y. (2014). Increasing dietary phosphorus intake from food additives: potential for negative impact on bone health. *Advances in Nutrition*, 5(1), 92-97.

Telama, R. (2009). Tracking of physical activity from childhood to adulthood: a review. *Obesity facts*, 2(3), 187-195.

Türkiye Beslenme Rehberi (TÜBER) 2022, Sağlık Bakanlığı, Halk Sağlığı Genel Müdürlüğü, Sağlık Bakanlığı Yayın No:1031, Ankara.

Udensi, U. K., & Tchounwou, P. B. (2017). Potassium homeostasis, oxidative stress, and human disease. *International journal of clinical and experimental physiology*, 4(3), 111.