Artículo original / Original Article

Application of Sports Nutrition Protocol in "Non-Athlete" subjects aimed at Body Recomposition: An Observational Study

Aplicación de un Protocolo de Nutrición Deportiva en Sujetos 'No Deportistas' con el Objetivo de la Recomposición Corporal: Un Estudio Observacional

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DOI: 10.17398/1885-7019.22.79

Recibido: 03/06/2025; Aceptado: 21/10/2025; Publicado: 23/03/2026

OPEN ACCESS

Sección / Section:
Physiology of Sport and Exercise

Editor de Sección / Edited by:
Sebastián Feu, Universidad de Extremadura, España

Citación / Citation:
Rossi, C.; Drid, P.; Bianco, A.; Pedone, F.; Kulis, S.; Greco, I.; Ferrara, G.; Patti, A. Giustino, V. & Patrizia, P. (2026). Aplicación de un Protocolo de Nutrición Deportiva en Sujetos `No Deportistas` con el Objetivo de la Recomposición Corporal: Un Estudio Observacional. *E-balonmano Com, 22*(1), 79-88

Fuentes de Financiación / Funding:
-

Agradecimientos/ Acknowledgments:
.

Conflicto de intereses / Conflicts of Interest:
All authors declare no conflict of interest

Abstract

Introduction: Non-athletic individuals with low physical activity and high fat mass may benefit from structured nutritional plans. This study evaluated the effectiveness of an athlete-based nutritional protocol (e.g., high protein intake) in improving body composition reducing fat mass while preserving lean mass in non-athletes performing mild physical activity. **Methods:** Fifty-seven subjects (mean age 34.5 ± 15.87 years) engaged in mild "Fitness" activity (3 sessions/week) were assessed before (T0) and after (T1) at least 3 months of nutritional intervention, using multi-frequency BIA (InBody 320). **Results:** After 3 months, participants showed significant reductions in body weight ($p<0.001$) and fat mass ($p<0.001$), with maintenance or increases in lean mass ($p<0.001$). Improvements were also observed in blood biomarkers, metabolic syndrome risk, and basal metabolic rate, supporting long-term result stability.
Conclusions: An athlete-oriented nutritional protocol was effective in improving body composition and health markers in non-athletic individuals with mild activity levels, even over a short period.

Keywords: sports nutrition; body recomposition; physical activity; well-being; obesity.

Resumen

Introducción: Las personas no deportistas con actividad física leve y masa grasa elevada pueden beneficiarse de planes nutricionales estructurados. Este estudio evaluó la eficacia de un protocolo nutricional basado en las directrices para atletas (por ejemplo, alto consumo de proteínas) en la mejora de la composición corporal —reducción de grasa y preservación de masa magra— en sujetos no atletas que realizan actividad física leve. **Métodos:** Se evaluaron 57 sujetos (edad media 34,5 ± 15,87 años) que practicaban actividad física tipo "Fitness" (3 veces por semana). Las mediciones se realizaron antes (T0) y después (T1) de un mínimo de 3 meses de intervención nutricional, utilizando BIA multifrecuencia (InBody 320). **Resultados:** Tras 3 meses, se observó una reducción significativa del peso corporal ($p<0,001$) y de la masa grasa ($p<0,001$), con mantenimiento o incremento de la masa magra ($p<0,001$). También mejoraron parámetros bioquímicos, el riesgo de síndrome metabólico y la tasa metabólica basal, lo que respalda la estabilidad de los resultados a largo plazo. **Conclusiones:** Un protocolo nutricional basado en pautas para atletas fue eficaz para mejorar la composición corporal y los marcadores de salud en individuos no deportistas con actividad física leve, incluso en períodos relativamente cortos.

Keywords: Nutrición deportiva; recomposición corporal; actividad física; bienestar.

Introduction

Obesity is a growing public health problem worldwide and is a major risk factor for many chronic diseases, including diabetes, cardiovascular disease, and metabolic disorders (Phipps & Helton, 2023). To address this growing challenge, much research has focused on finding effective therapeutic approaches to improve the body composition and metabolic health of overweight individuals (Dagpo et al., 2020; Guillamón & Cantó, 2017). In particular, in recent years, attention has focused on the possibility of obtaining a significant reduction in fat mass without compromising lean mass or causing excessive weight loss (Lukic-Sarkanovic et al., 2024; Maksimovic et al., 2024; Milovancev et al., 2024). This goal is particularly relevant for non-athletes who lead a sedentary lifestyle or engage in only moderate physical activity and who have a body fat percentage above the normal range. The increase in levels of sedentary lifestyle, associated with reduced physical activity and unhealthy eating habits in children and adolescents, represents a serious risk factor for public health, contributing significantly to the incidence of non-communicable diseases and generating a growing impact on health systems globally (Browne & Cuda, 2022). The recent guidelines of the World Health Organization (WHO) underline the importance of a balanced diet and daily physical activity, promoting educational interventions aimed not only at physical well-being, but also at cognitive, motor, social and emotional-affective development (Herforth et al., 2019). A key approach to achieving this is the administration of a specially structured nutritional protocol, based on guidelines suited to an athlete, with particular attention to the amount of protein provided and other key nutrients. It is known that an adequate protein intake and the correct distribution of other nutrients can positively influence metabolism and body composition, favouring greater loss of fat mass and a smaller reduction in lean mass (Tomé et al., 2021). However, to obtain optimal results, the nutritional protocol must be personalised and adapted to the specific needs and characteristics of the subjects involved in the study. This will maximise the benefits of moderate physical activity and adequate nutrient intake, while minimising potential negative health effects and ensuring healthy, sustainable weight loss (Layman, 2024). In clinical practice, it is common to find non-athletic individuals who engage in mild physical activity, require a specific diet for weight loss, and have a higher-than-normal fat mass. This situation is often not necessarily identified with a high BMI, as BMI is a quantitative and not a qualitative parameter, which only considers the ratio of height to weight, without assessing body composition in terms of percentages of lean mass and fat mass (Carey et al., 2006). Studies show that BMI may not be an accurate indicator of body fat distribution and metabolic health, making a more in-depth assessment of body composition necessary (Padua et al., 2023). Furthermore, lean mass and fat mass significantly influence metabolism and the risk of chronic diseases, independent of BMI (García et al., 2007; Lee, 2017). Individuals with excess fat mass have an average lower metabolism than those with the same weight who have a better lean mass/fat mass ratio, and this condition predisposes to the onset of metabolic syndrome, especially as a function of age. The classic approach in low-calorie diets involves an almost linear loss of weight and fat mass (Eslami et al., 2022). Colliding with the limit imposed by the possibility of losing beyond a certain weight, even if the percentage of fat mass still exceeds normal reference values (Longo et al., 2019). Physical exercise is well known in scientific literature as a positive activity for the human body, which leads to numerous benefits (mental, physical, etc.) and which fights obesity and all the problems associated with it (Pojednic et al., 2022). Technically, obesity is defined as an abnormal accumulation of ≥20% of fat mass compared to the ideal weight of the individual (Organization, 2000). The latter constitutes the maximum healthy value for an individual, calculated mainly on the basis of height, age, body size and degree of muscle development (Thomas et al., 2012). However, not all obese individuals develop obesity-related metabolic or cardiovascular disorders, potentially due to the preservation of normal adipose tissue architecture and function (Smith, 2015). Most patients with obesity have impaired adipose function caused by the interaction of genetic and environmental factors, leading to adipocyte hypertrophy, hypoxia, a variety of stresses, and inflammatory processes within the adipose tissue (Cheong et al., 2025). Ectopic fat accumulation, including visceral obesity, can be considered a consequence of adipose tissue dysfunction, characterized by changes in cellular composition, increased lipid accumulation, reduced insulin sensitivity in adipocytes, and secretion of a pattern of pro-inflammatory, atherogenic, and diabetogenic adipokines (Commission, 2017). The objective of our study was to verify and observe the possible improvement in body composition, avoiding an excessive decrease in weight and lean mass, but obtaining a significant decrease in fat mass through the administration of a nutritional protocol structured according to the guidelines for an athlete (quantity of protein, etc.) to non-athlete subjects who practice mild physical activity, with a fat mass higher than the normal range.

Materials and methods

An observational study was conducted at the Nutritional Study of Dr. Ida Greco, located in Palermo, Italy. The study involved a total of 57 participants aged between 18.63 and 50.37 years, with a mean age of 34.5 ± 15.87 years. All participants engaged in a structured, supervised resistance training program ("Fitness"), consisting of mild-intensity exercises performed three times per week. The protocol was standardized and is described in detail in the Methods section. Participants in this observational study fulfilled the following inclusion criteria: adults aged between 18 and 55 years, both male and female, with a body mass index (BMI) between 18.5 and 35 kg/m², willing and able to participate in a structured resistance training programme combined with a nutritional intervention. All participants were free of acute or chronic diseases that could contraindicate physical activity or influence metabolic status. Exclusion criteria were: presence of cardiovascular, respiratory or metabolic diseases; current use of drugs that affect body composition or metabolism; pregnancy or lactation; any orthopaedic or neurological conditions that limit participation in exercise; and non-compliance with nutritional or training protocols. These criteria ensured a relatively healthy population capable of safely participating in the intervention, while providing reliable data on the effects of combined nutrition and exercise strategies.

Data Collection and Measurements

Demographic, anthropometric, and echocardiographic parameters were assessed at baseline and after three months of intervention with a structured nutritional plan. Body composition analysis was conducted using a multi-frequency bioelectrical impedance analyzer (BIA) - InBody 320 (Fig. 10,11). Bioelectrical impedance analysis (BIA) is widely recognized in clinical research for its high precision and reliability in estimating body composition, particularly in the assessment of hydration status. Fluid balance was monitored since body water homeostasis is a crucial indicator of metabolic changes, both in pathological conditions such as chronic diseases, infections, endocrine-metabolic disorders, and cardiovascular diseases, as well as in physiological conditions such as exercise, aging, and growth.

Nutritional Intervention

Participants adhered to a specific nutritional protocol, designed in accordance with athlete-based guidelines, but adapted for non-athletic individuals performing mild physical activity. The dietary plan provided a daily intake of 1.6 g protein, 1.6 g carbohydrates, and 0.6 g fat per kg of body weight, ensuring adequate macronutrient balance to optimize metabolic health and body composition.

Anthropometric Analysis

Anthropometric parameters were assessed at baseline and follow-up, including body height (H), body weight (BW), gender, and body mass index (BMI), along with the classification of overweight/obesity status. Additionally, fat-free mass (FFM) and fat mass (FM) were measured to evaluate body composition variations induced by nutritional and exercise interventions. The examinations were conducted with participants in a supine position to ensure measurement consistency.

Training protocol

The protocol was adapted and carried out for the patients by experts in motor sciences, all training sessions were carried out under close observation.

The protocol presents continuity and ramp up for each period, divided into 3 macro-moments presented in table 1:

Table 1. Progressive 12-Week Periodized Training Protocol

Weeks	Type of Training	Exercises	Intensity	Heart Rate	Sets & Reps	Rest
1-4	Cardio (20 min)	Brisk walking, low-intensity biking, elliptical, swimming	Moderate (you can speak but with effort)	~30% of max HR	—	—
	Resistance (30 min)	Squats, bench press, dumbbell rows, lateral raises, crunches, dumbbell exercises for upper limbs	Moderate overload	—	2-3 sets x 10-15 reps	~1 min between sets
5-8	Cardio (30 min)	Biking, elliptical, swimming (with intensity intervals)	Moderate to high	~60% of max HR	—	—
	Resistance (35 min)	Squats with a barbell, lunges with dumbbells, easy push-ups, barbell rows, lateral raises, front raises, sit-ups	Moderate overload	—	3 sets x 8-12 reps	~1 min between sets
9-12	Cardio (30-40 min)	Light jogging, light spinning, biking, elliptical (with intensity intervals)	Moderate with short active recovery periods	~70% of max HR	—	—
	Resistance (30-40 min)	Squats, lat machine, shoulder machines, abs	Moderate to vigorous overload	—	4 sets x 8-12 reps	~2 min between sets

Statistic analysis

The data thus obtained were sorted in the Microsoft Office Excel package (version 2019, Microsoft Inc., Italy), while for the processing of the statistical data, the Statistical Package for Social Sciences (*SPSS software package* and the Statistica statistical package, StatSoft were used. Data processing included descriptive and inferential statistical methods. Numerical characteristics are presented by means (arithmetic mean, median) and measures of variability (value range, standard deviation, interquartile range) and attributes using frequencies and percentages. Depending on the nature of the data, the comparison of the values of the numerical characteristics was carried out using the student's t-test, with paired data between the beginning of the protocol (T0) and after 3 months (T1). The Shapiro-Wilk normality test was performed to evaluate the distribution of the variables. The results are presented in tables and graphs. The significant values present various levels of significance with $p < 0.05$, $p<0.01$, $p<0.001$.

Results

Over three months, in the context of our observational study, we introduced a specific nutritional regimen, inspired by the guidelines for athletes, intended for non-athletic individuals performing light physical activity. We provided participants with an average daily nutrient intake of 1.6 grams of protein, 1.6 grams of carbohydrates, and 0.6 grams of fat per kilogram of body weight, which over a 3-month range resulted in statistically significant improvements in terms of body recomposition. Furthermore, diets structured in this way reduce hunger attacks thanks to the increased sense of satiety due to the increased consumption of proteins and the consequent reduction in the glycemic load, thus creating an optimal virtuous circle for the patient and their compliance.

Non-athlete subjects who received an application even for short periods (minimum 3 months) of a specific nutritional protocol for athletes accompanied by mild physical activity would appear to obtain an improvement in body composition, a decrease in weight (p<0.001), in particular a reduction in fat mass (p<0.001), and a maintenance, and sometimes even an increase in lean mass, i.e. metabolically active mass (p<0.001).

Table 2. Descriptive analysis of the parameters examined.

	Mean ±SD
Weight – T0 *(Kg)*	77.69 ± 18.48
Weight – T1 *(Kg)*	68.78 ± 15.38
FFM – T0 *(%)*	65.07 ± 6.58
FFM – T1 *(%)*	72.12 ± 7.12
FM – T0 *(%)*	34.93 ± 6.58
FM – T1 *(%)*	27.88 ± 7.12

FFM – lean mass; FM – fat mass; SD – standard deviation

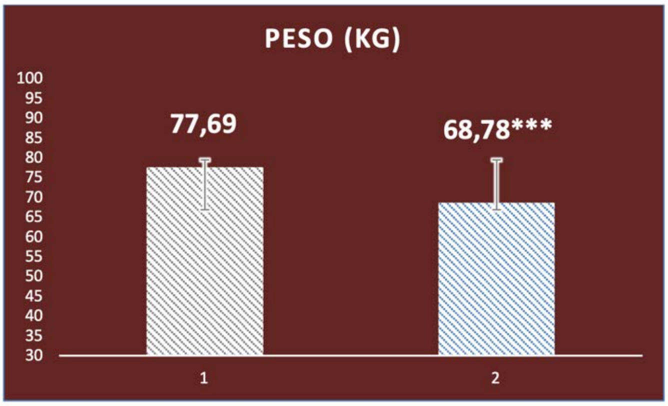
In Table 2, we find the descriptive analysis, with the mean, standard deviations. In table 3, we find a paired data t-test of measurement 0 (beginning) and 1 (after 3 months of nutritional protocol and mild physical activity).

Table 3. Analysis of parameters

		Mean ±SD	**P value**
T0 weight *(Kg)*	**T1 weight** *(Kg)*	8.9123	< .001 ***
T0 FFM *(%)*	**T1 FFM** *(%)*	7.05	< .001***
T0 FM *(%)*	**T1 FM** *(%)*	-7.06	< .001***

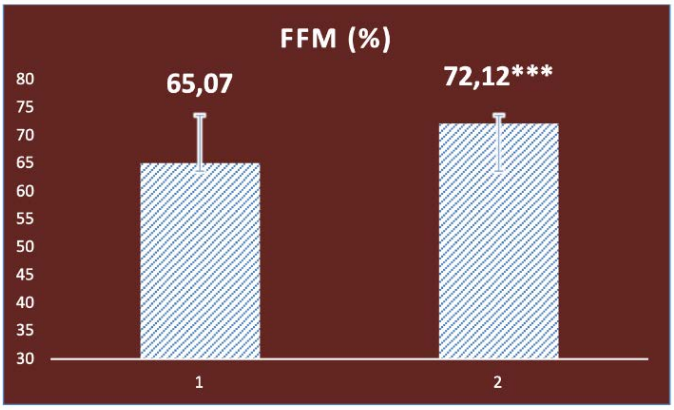
FFM – lean mass; FM – fat mass; SD – standard deviation; p value – statistically significance

Statistically significant results were found both in the FFM (65.07 ± 6.58 % vs 72.12 ± 7.12 %), with a significant increase in the FM (34.93 ± 6.58 % vs 27.88 ± 7.12%), with a notable reduction. Subsequently, graphs were inserted regarding the trend of the variables analysed in the present study in the T0–T1 measurements.



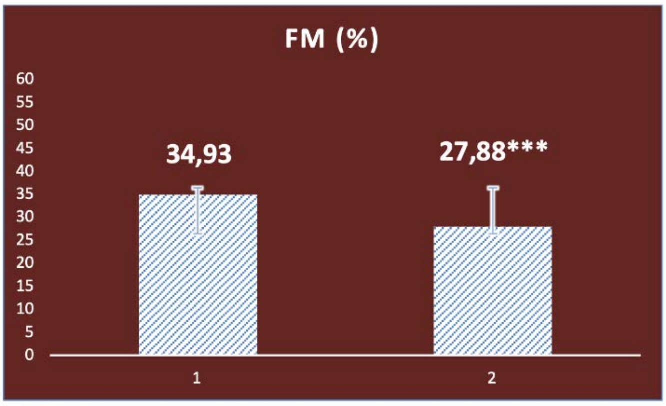
Graph 1. Body weight

**** - Statistically significant difference between T0 and T1 (p = 0.001); 1 – First measurement (T0); 2 – Second measurement (T1)*



Graph 2. FFM – Lean mass

**** - Statistically significant difference between T0 and T1 (p = 0.001); 1 – First measurement (T0); 2 – Second measurement (T1)*



Graph 3. FM – Fat mass

**** - Statistically significant difference between T0 and T1 (p = 0.001); 1 – First measurement (T0); 2 – Second measurement (T1)*

Discussions

The objective of our study was to evaluate whether and how a nutrition protocol according to the guidelines for trained subjects, carried out in subjects who practice mild physical activity with overweight and obesity, could avoid, together with the loss of fat mass, an excessive loss of lean mass.

Our results suggest that non-athlete subjects who received an application even for short periods (minimum 3 months) of a specific nutritional protocol for athletes accompanied by mild physical activity would appear to obtain an improvement in body composition, a decrease in weight (p<0.001), in particular a reduction in fat mass (p<0.001), and a maintenance, and sometimes also an increase in lean mass, i.e. metabolically active mass (p<0.001).

In the literature, it is known that the low-calorie diet leads not only to a loss of fat mass, but also to a loss of lean mass; however, applying a plan to athlete subjects would seem to lead to a decrease in this negative effect.

Adipose tissue has a pro-inflammatory effect on the tissues and organs of the human body (Coppack, 2001; Grant & Dixit, 2015; Tordjman et al., 2008)and even in our study, subjects with lower fat mass had positive sensations.

The activity that our patients carried out, as well as fitness activities, is an activity that played a fundamental role in helping the nutritional factor in preserving lean mass, since even if only a few times a week it is an activity that works well, leads to numerous beneficial factors, including that of increasing lean mass (Folkins & Sime, 1981).

Fitness activity is an activity that also brings numerous benefits in the fight against various pathologies, such as cardiovascular, respiratory, diabetes mellitus II, etc. (Baldassano et al., 2023; Bouchard et al., 2012; Hoffman, 1986; Saunders et al., 2020; Tian & Meng, 2019).

An advantage of this study is that, in the existing scientific literature, the application of this protocol, originally designed for athletic individuals, to sedentary or lightly active subjects has not yet been explored, necessitating further investigation (Calella et al., 2024).

This study enables the exploration of various practical implications. The implementation of nutritional protocols derived from athlete-specific guidelines could serve as a foundation for developing personalized meal plans tailored to non-athlete individuals pursuing body recomposition goals (Burke et al., 2019). This approach could allow nutritionists and dietitians to customize dietary interventions based on the specific physiological needs of each patient (Witard et al., 2025).

Weight management programs could integrate athlete-oriented nutritional strategies to enhance fat loss while preserving or increasing lean mass, a crucial factor for long-term metabolic health (Locatelli et al., 2024). Moreover, these protocols could be incorporated into intervention programs for metabolic syndrome, potentially mitigating the risk of related pathological conditions through targeted dietary modifications (Ryan, 2025).

Furthermore, the findings of this study may inform the development of structured support programs for individuals with obesity who seek to improve their body composition in a sustainable manner (James et al., 2024). As a result, this framework could be instrumental in formulating nutritional plans that minimize the depletion of lean mass during weight reduction, thereby optimizing health outcomes (Castro-Barquero et al., 2020).

These implications could have a significant impact on clinical and nutritional practice, providing a framework for innovative and targeted approaches to improving body

This study presents several important limitations. First, the absence of a control group limits the ability to make direct comparisons and draw more robust conclusions about the effectiveness of the intervention. Future studies should include a control group to allow for deeper and more reliable interpretations. Additionally, the small sample size reduces the statistical power of the findings; expanding the sample in future research would improve representativeness and generalizability.

Another limitation is the lack of waist-to-hip ratio (WHR) measurement, a standard anthropometric indicator for assessing central obesity. Including WHR could have provided a more accurate evaluation of fat distribution and cardiometabolic risk.

Although the results of our study are promising, further research should explore additional training modalities or the inclusion of dietary interventions to optimize improvements in body composition. It is also essential to assess the long-term effects of training in individuals with overweight and obesity, in order to better understand the sustainability of the outcomes over time.

Further studies are needed to understand and expand knowledge on this topic.

Conclusion

The administered protocol demonstrated efficacy, resulting in a statistically significant reduction in fat mass while preserving, and in some cases enhancing, lean mass. These findings suggest that adherence to nutritional guidelines designed for athletes can yield positive effects on body composition even in non-athlete individuals engaged in mild physical activity. Furthermore, the observed overall improvement in health parameters indicates that such protocols, when applied to adult and medically assisted populations, including those in para-physiological states, may be considered safe for short-term implementation. To substantiate these observations and deepen our understanding, further studies will be conducted.

Author Contributions: Conceptualization: C.R., P.P., A.B.; Methodology: C.R., V.G., A.P.; Data collection: C.R., G.F., F.P., I.G.; Formal analysis: V.G., A.P., S.K.; Investigation: G.F., F.P., P.D.; Writing – original draft preparation: C.R., V.G.; Writing – review and editing: A.B., P.P., P.D.; Supervision: P.P., A.B.; Project administration: A.B., P.P

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