

The Influence of Effective Food, Dietary Supplements, and Regular Exercise on Sports Performance: An Experimental Study on Elite Athletes in Islamabad

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Abstract

This research aimed to examine the impact of regular physical exercise, dietary supplementation, and effective food consumption on the performance of young adults. A total of 65 participants aged between 15 and 40 years (Mean = 24.6 years, SD = 5.59) were enrolled and categorized into four groups: 1) Regular Exercises, 2) Dietary Supplements, 3) Effective Food, and 4) Control. The study utilized a quasi-experimental pre-test/post-test design to evaluate physical attributes such as explosive strength (via backward throw with a 3 kg medicine ball), agility (Agility T-Test), leg strength, speed (30-meter sprint), and endurance (800-meter run). Demographic analysis revealed that participants were predominantly single, belonged to joint family systems, and had educational backgrounds mostly at the middle and matriculation levels. The Regular Exercises group demonstrated the most substantial improvements, with statistically significant enhancement observed in backward throw performance ($p < 0.001$), agility ($p = 0.045$), and endurance ($p = 0.027$). Although leg strength and sprint performance also showed numerical improvement in this group, these changes were not statistically significant. The Dietary Supplements group exhibited a significant increase in endurance performance ($p = 0.03$), but did not show meaningful changes in other physical domains. The Effective Food group also demonstrated a notable improvement in endurance ($p = 0.007$) and borderline gains in backward throw ($p = 0.05$), though these changes were not consistently significant across all tests. The Control group exhibited no significant differences in any of the performance parameters, confirming the effectiveness of intervention-based improvements. Further statistical analysis using One-Way ANOVA and post hoc comparisons showed highly significant differences between the groups in post-intervention backward throw performance ($F = 92.41$, $p = 0.000$, $\eta^2 = 0.82$), with the Regular Exercises group significantly outperforming all others. Endurance performance also differed significantly between groups after the intervention ($F = 4.2$, $p = 0.009$, $\eta^2 = 0.17$), again favoring the Regular Exercises group. However, no statistically significant differences were observed in post-test sprint speed, leg strength, or agility among the Dietary Supplements, Effective Food, and Control groups. These findings showed the critical role of structured physical training in improving core fitness components such as strength, endurance, and agility. While dietary supplements and nutritional interventions may provide marginal support for physical performance, they are not a substitute for regular exercise. The study suggests that exercise-based programs should be prioritized in physical education curricula and fitness training modules to enhance overall athletic performance and well-being. Additionally, future research with larger sample sizes and longer intervention periods could further validate these outcomes and explore synergistic effects of combining exercise with nutritional strategies.

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INTRODUCTION

Food is one of the vital necessity for sustaining life. We cannot ignore how important food is to our daily lives. Our body requires energy from food in order to work properly. This energy is derived from the food. Food constituents can be categorized into micronutrients and macronutrients. Both macronutrients and micronutrients must be used by athletes. Athletes who are deficient in macronutrients and micronutrients may perform poorly or poorly throughout competition. Players in the synthesis of energy, bone health, immunological response, and antioxidant activity depend on macronutrients. While micronutrients by themselves do not provide energy, they do assist in preserving an athlete's body's ability to function (Rattan & Kaur, 2022)..

Food has six basic components: water, carbohydrates, proteins, fats (saturated and no saturated), vitamins (Vit A, B, C,D, etc.), and minerals. Each of these basic component supply the energy to the body for proper functioning. The energy and nutrient requirements of individuals engaged in athletic practices diverge from those of non-athletic individuals (Akram et al., 2020). Sportsmen require extra calories which are provided by macronutrients to maintain their energy and strength enabling them to achieve adequate efficiency during competitions. In addition to adequate macronutrient and caloric intake, athletes frequently need increased levels of minerals, vitamins and other vital nutrients to maintain peak athletic performance (Casazza, Tovar, Richardson, Cortez, & Davis, 2018). In evaluating an athlete's dietary requirements and aims, nutrition professionals must take into account multiple sport-specific factors, such as seasonal structure, event scheduling, physical environment, game rules, match regularity and competition timing (Malsagova et al., 2021).

In order to improve performance and recuperation, it is advised that athletes take enough energy and the right ratio of macro- and micronutrients at the right time (Patnaik, 2024). For athletes, it is imperative to recognize how nutrition contributes to physical, emotional, and mental stresses encountered in competition (Chang de Pinho, Giorrelli, & Oliveira Toledo, 2024). Performance in sports can be improved through well-structured dietary and nutrition planning. Performance of athlete can be enhanced by sufficient proper food intake. Nutrition guidelines for athlete suggest that different food groups should be taken in different percentages (Dhiman & Kapri, 2023; Tan, 2024). Sports nutrition standards advise that protein consumption be sustained at 1.2 to 1.7 kg/g/day (Gjevestad, 2017), carbohydrates maintained between 3 and 12 kg/g/day depending on physical intensity (BODYCOMPOSITION, 2016), and fat contributing 20% to 35% of total energy intake (Heydenreich, Kayser, Schutz, & Melzer, 2017). Recently, these guidelines—developed for adults—were also considered adequate for adolescents (Lassi et al., 2017). Adhering to the Dietary Reference Intakes (DRI) standards for micronutrient consumption is crucial for optimal athletic function (White, 2024). In general, people consume more protein than is advised while occasionally consuming less carbohydrate than is suggested (Stuart M Phillips et al., 2015). With certain research indicating intakes below the DRI, there is also cause for concern over the appropriate consumption of some micronutrients (Yaktine & Ross, 2019). Most frequently, athletes seem to lack information regarding the importance of macronutrients, the fundamental roles that macronutrients, vitamins, and minerals play in the body, the right use of supplements, and how supplements impact performance (Ghazzawi et al., 2023).

LITERATURE REVIEW

An athlete with a daily training schedule has unique nutritional needs, especially an elite athlete whose training schedule resembles a full-time work. However, engaging in recreational

sports can pose nutritional concerns. Regardless of your degree of athletic participation, you need to rise above these obstacles in order to get the most out of your training. A large portion of your training's aim may be defeated if you don't eat healthfully. In the worst situation, nutritional issues and inadequacies could have a direct negative impact on training effectiveness(Jagim, Fields, Magee, Kerk sick, & Jones, 2022). In other circumstances, you may advance, but not to the full extent of your abilities or as quickly as your rivals. Positively, though, you can fully reap the rewards of your workout dedication if you follow the correct daily food plan.

Athlete success is influenced by a multitude of things. Of them, genetic endowment is without a doubt the most significant; yet, the genotype's inherent gift for athletics can be altered by a number of circumstances (Guth & Roth, 2013). A structured training program that is rigorous and regular and is implemented over a number of years is likely the most important of these. In addition to techniques and other elements, successful athletes will be motivated to engage in this training(Yang, Xu, & Le, 2024). But in situations where everything else is equal, as they often are in competitive sports where results are never certain, a variety of small details might decide the winner. Making poor food choices can turn an average athlete into a champion, while making good food choices won't(Pelly, Thurecht, & Slater, 2022).

Over the past two decades, nutritional practices for elite athletes have undergone substantial revision, reflecting ongoing discoveries in the field of nutrition science(Hopper, Mooney, & Mc Cloat, 2025). Until recent developments, nutritional strategies in sports primarily concerned with Supporting athlete recovery between training sessions to allow intense and consistent training while minimizing fatigue and illness(Adam Amawi et al., 2024). Addressing the effects of energy exhaustion and dehydration, resulted in targeted nutritional approaches involving fluid intake and carbohydrate consumption. However, there has been a shift in focus more lately toward figuring out how sports nutrition might support the changes that occur in tissues as a result of the training stimulus(Jeukendrup, 2017). Energy, macronutrients, and micronutrients are still necessary for athletes, but sports nutrition is now more about (J. A. Hawley, Burke, Phillips, & Spriet, 2011). A food-first concept is promoted as being crucial for health and performance in sports by a variety of expert guidelines and professional recommendations (Collins et al., 2021; Ronald J Maughan et al., 2018);(Thomas, Erdman, & Burke, 2016a).

The significance of a tailored sports diet has long been acknowledged as a fundamental requirement for athletes across all levels of competitive settings. According to Hoch *et al.*, (2008) a proper sports nutrition enhances athletic outcomes by minimizing the risk of injury or illness and reducing the likelihood of fatigue. It further contributes to optimal training performance and expedites the physiological recovery process in athletes. For the purpose of competition, training, and recovery, athletes need to provide their bodies with the right kinds of nutrients. There is a higher chance of underwhelming performance and health problems if these nutritional requirements are not satisfied (Hoch, Goossen, & Kretschmer, 2008).

The fundamental component of an athlete's dietary strategy is adequate energy intake, which supports bodily functions, enables captivation of essential nutrients, and contributes to sustaining an appropriate body composition. Athletes may evaluate their energy consumption from supplements, beverages, food and through methods such as food frequency surveys, 24-hour dietary recalls, and measured or weighed or food records typically sustained over a period of several consecutive days (A. Martín-Rodríguez et al., 2024). All of these techniques have significant drawbacks, including a tendency to underestimate intakes. Comprehensive training on the rationale behind and best practices for recording intakes could help ensure that self-



reported data is more accurate and legitimate while also promoting compliance. In the meantime, an athlete's energy needs are determined by their customized training and competition schedule, and they will alter daily across the year due to disparities in training intensity and volume. Exposure to heat or cold, stress, anxiety, exposure to high altitudes, and some physical traumas are among the factors that cause an increase in energy consumption beyond normal baseline levels (Thomas, Erdman, & Burke, 2016b). The effect of physical features such as shape, size, and body composition on athletic performance broadly acknowledged across diverse sports disciplines. Athletes frequently concentrate on body composition and weight, as these characteristics are commonly prioritized by athletes seeking to optimize performance(Mathisen et al., 2023). Even though adjusting body composition may influence athletic development, it is crucial for athletes and coaches to understand that these measures may not be considered as sole predictors' performance. It is not advisable to prescribe a single, strict "optimal" body composition for every given event or set of participants.¹⁵ However, there are connections between athletic performance and body composition that should be taken into account when an athlete is preparing. (Pavlidou, Papadopoulou, Seroglou, & Giaginis, 2023)

RESEARCH METHODOLOGY

This study is quantitative in nature with experimental that aims to examine relationship in chasing the hypotheses and reaching conclusion. The positivism approach was used to chasing relationships among research variables (food, dietary habits, and exercise) of study. The research approach specifies the way through which data is collected from the respondents by retrieving them to reach their answers about variables of research in order to reach required conclusion through justification towards desired outcomes. The population of interest in this research is students hailing from colleges in Islamabad, Pakistan wherein 66 students from colleges wherein a sample is drawn from population, has been extracted by using the sampling formula widely used in the social research studies. Thus, 66 questionnaires were distributed among which 66 were recollected and used for analysis. Similarly, the random simple technique was used to access the population of study which comes under the non-probability technique to ensure required data from diverse dimensions. Also, both secondary and primary data were used to collect data from respondents and from existing knowledge databased to analyze data to reach conclusion. The questionnaires were adopted from previous studies. Similarly, 5-point Likert scale was used to record responses of respondents about research issues in particular context to access respondents and achieving desired outcomes.

RESULTS OF STUDY

Descriptive Statistics

Variable	Group	N	Mean	Std. Deviation	Minimum	Maximum
Age	Regular Exercises	16	25.06	5.31	15.00	33.00
	Dietary Supplements	17	25.71	6.74	17.00	40.00
	Effective Food	16	24.69	3.32	19.00	32.00
	Control	16	22.88	6.40	16.00	36.00
	Total	65	24.60	5.59	15.00	40.00
Height (cm)	Regular Exercises	16	175.45	8.56	160.02	190.50
	Dietary Supplements	17	179.64	4.81	172.72	188.72
	Effective Food	16	178.28	5.95	165.10	185.42
	Control	16	181.98	8.80	162.56	198.12
	Total	65	178.85	7.42	160.02	198.12

Variable	Group	N	Mean	Std. Deviation	Minimum	Maximum
Weight (kg)	Regular Exercises	16	74.50	11.41	55.00	98.00
	Dietary Supplements	17	77.18	11.01	62.00	103.00
	Effective Food	16	71.75	8.24	60.00	90.00
	Control	16	74.25	10.34	55.00	89.00
	Total	65	74.46	10.28	55.00	103.00
BMI	Regular Exercises	16	24.29	3.77	19.00	32.20
	Dietary Supplements	17	23.78	2.59	20.80	29.20
	Effective Food	16	22.50	2.27	19.50	27.10
	Control	16	22.46	3.02	17.00	27.40
	Total	65	23.26	3.00	17.00	32.20
Monthly Income (PKR)	Regular Exercises	14	27107.14	9152.93	17000.00	50000.00
	Dietary Supplements	13	29461.54	14830.24	20000.00	74000.00
	Effective Food	15	24233.33	8024.22	15000.00	50000.00
	Control	13	22692.31	8086.87	10000.00	35000.00
	Total	55	25836.36	10341.42	10000.00	74000.00

Table: Pre Post Analysis in Regular Exercise Group

Group	Test	N	Pre	Post	Mean Difference	95% CI		P-value
			Mean±SD	Mean±SD		Lower	Upper	
Regular Exercises	Backward throw (m)	16	10.26±0.11	13.95±0.65	-3.68	-3.99	-3.38	0.00***
	Speed Test 30m (s)	16	4.66±0.56	4.43±0.61	0.23	-0.05	0.52	0.10
	Leg Strength Test (m)	16	6.44±0.47	6.51±1.18	-0.07	-0.89	0.74	0.85
	Agility T Test (s)	16	10.93±1.19	10.72±0.87	0.21	-0.77	1.19	0.65
	800M Endurance Test (min/s)	16	3.11±0.54	3.20±0.52	-0.09	-0.56	0.39	0.70

The Dietary Supplements group showed a statistically significant improvement in the 800M endurance test (Mean Difference = 0.29 min/s, 95% CI: 0.04-0.54, p = 0.03), with a marginal but non-significant trend in agility (p = 0.08).

Table: Pre Post Analysis in Dietary Supplement Group

Group	Test	N	Pre	Post	Mean Difference	95% CI		p-value
			Mean±SD	Mean±SD		Lower	Upper	
Dietary Supplements	Backward throw (m)	17	10.20±0.11	10.58±1.33	-0.39	-1.06	0.29	0.24
	Speed Test 30m (s)	17	4.71±0.54	4.88±0.54	-0.17	-0.40	0.07	0.16
	Leg Strength Test (m)	17	6.16±0.62	6.07±0.54	0.09	-0.28	0.45	0.62
	Agility T Test (s)	17	11.14±1.11	11.71±1.13	-0.57	-1.21	0.07	0.08
	800M Endurance Test (min/s)	17	3.04±0.53	2.75±0.54	0.29	0.04	0.54	0.03*

Similarly, the Effective Food group exhibited significant endurance gains (Mean Difference = 0.43 min/s, 95% CI: 0.14-0.73, p = 0.007) and a borderline improvement in the backward throw (p = 0.05), though other metrics remained unchanged.

Table : Pre Post Analysis in Effective Food Group

			Pre	Post		95% CI		
Group	Test	N	Mean±SD	Mean±SD	Mean Difference	Lower	Upper	P-value
Effective Food	Backward throw (m)	16	10.26±0.10	10.18±0.11	0.08	-0.00	0.16	0.05
	Speed Test 30m (s)	16	4.66±0.56	4.62±0.44	0.04	-0.08	0.16	0.50
	Leg Strength Test (m)	16	6.44±0.46	6.37±0.27	0.07	-0.15	0.29	0.50
	Agility T Test (s)	16	10.93±1.18	11.08±1.07	-0.15	-0.94	0.64	0.69
	800M Endurance Test (min/s)	16	3.11±0.54	2.67±0.52	0.43	0.14	0.73	0.007**

The Control group, as expected, showed no significant differences across tests ($p>0.05$), with identical pre/post scores for leg strength, agility, and endurance, rendering statistical analysis inapplicable for these outcomes.

Table: Pre Post Analysis in Control Group

		Pre	Post	95% CI				
Group	Test	N	Mean±SD	Mean±SD	Mean Difference	Lower	Upper	P-value
Control	Backward throw (m)	16	10.20±0.08	10.18±0.08	0.02	-0.00	0.04	0.06
	Speed Test 30m (s)	16	4.85±0.64	4.84±0.63	0.01	-0.01	0.02	0.48
	Leg Strength Test (m)	16	6.15±0.68	6.15±0.68	0.00	N/A	N/A	N/A
	Agility T Test (s)	16	11.04±0.91	11.04±0.91	0.00	N/A	N/A	N/A
	800M Endurance Test (min/s)	16	3.12±0.45	3.12±0.45	0.00	N/A	N/A	N/A

DISCUSSION

The findings from the pre-post analysis in the Regular Exercise group offer meaningful insights into the impact of structured physical activity on specific components of sports performance. A statistically significant improvement was observed in the backward throw test (Mean Difference = -3.68 meters, 95% CI: -3.99 to -3.38, $p < 0.001$), indicating that the exercise regimen effectively enhanced upper body power and neuromuscular coordination. This test, which measures explosive strength and kinetic chain efficiency, is particularly responsive to compound and plyometric movements. The observed improvement is supported by literature, such as Markovic and Mikulic (2010), who reported that plyometric training significantly improves explosive power through neuromuscular adaptations, and Chelly et al. (2010), who found enhanced throwing performance following upper-body strength training in athletes(Chelly, Hermassi, Aouadi, Shephard, & Research, 2014).

However, no statistically significant changes were noted in speed, leg strength, agility, or endurance ($p > 0.05$). This may be attributed to several factors. First, the duration and specificity of the training program might not have been sufficient to elicit measurable improvements in these domains (Jullien et al., 2008). Speed, agility, and endurance are complex, multifactorial capacities that often require longer, more specialized, and periodized interventions for significant enhancement(Jalalovna & Journal, 2023). The findings are consistent with studies like those of Milanović et al. (2015), who emphasize the importance of sport-specific drills for agility and speed development Milanović et al. (2015), who emphasize the importance of sport-specific drills for agility and speed development,(Jalalovna & Journal, 2023), and Bishop et al. (2008), who note that endurance training must be sustained and

targeted to show significant effects (Bishop, Bartlett, Fyfe, & Lee, 2018). Additionally, the lack of change might have a ceiling effect, especially if participants were already moderately trained, reducing the scope for rapid improvement. Inter-individual variability, given the small sample size ($N=16$), may also have limited the statistical power to detect subtle improvements.

In conclusion, while the Regular Exercise program effectively improved upper body explosive strength as evidenced by the backward throw test, it did not significantly influence other performance metrics. This highlights the importance of designing comprehensive, goal-specific training programs that align with the intended performance outcomes. Future interventions should consider longer duration, progressive overload, and tailored drills, potentially integrated with nutritional and supplementation strategies, to optimize improvements across all components of sports performance (M. S. Kumar & Vinayakan).

The Dietary Supplements group demonstrated a statistically significant improvement in the 800M endurance test (Mean Difference = 0.29 min/s, 95% CI: 0.04–0.54, $p = 0.03$), suggesting a beneficial effect on cardiovascular and aerobic performance (N. Kumar & Badwe, 2024). Participants in this group received Creatine Monohydrate at a dose of 5 g/day, administered alongside a carbohydrate drink. While creatine is primarily recognized for its role in enhancing short-duration, high-intensity performance, evidence suggests that its co-ingestion with carbohydrates improves creatine uptake and may contribute to enhanced phosphocreatine resynthesis and delayed fatigue during submaximal efforts (Naderi, de Oliveira, Ziegenfuss, Willems, & biochemistry, 2016). This mechanism likely underpins the observed gains in endurance performance.

RECOMMENDATIONS

1. The education institutions may appoint well-trained and motivational physical education teachers, as their diverse roles are vital in guiding students and improving their executive functioning for desired outcomes.
2. The universities should encourage students to take part in physical activities regularly by offering dietary habits formation, sports programs, and fitness events as required towards desired developments and success.
3. The awareness campaigns should be held to inform students about how physical activity not only improves dietary habits, health but also boosts the brain functions like focus, memory, and self-control, required in diverse situations.
4. The physical activity should be integrated into the academic routine, especially during the stressful exam periods, to help students to manage stress, improve cognitive performance for attaining the outcomes.

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