ASSESSMENT OF DIETARY PATTERNS AND THEIR ASSOCIATION WITH PHYSICAL FITNESS PARAMETERS IN GYMNASTICS ATHLETES

Meghana Manohar kulsange
Research scholar
Glocal university, Saharanpur

Dr. Aseem Khan
Research Supervisor
Glocal university, Saharanpur

ABSTRACT

The given research explores the dietary trends and their correlation with the physical fitness parameters in gymnastics athletes, which is ranked among the groups with great training loads and sport-specific body composition needs. The data were collected using a descriptive and analytic type of research design where selected 120 gymnastics athletes were used as the primary data using purposive sampling of the identified training academies. Dietary intake was measured through the use of a food frequency questionnaire where 24-hour dietary recall method served in deriving dietary pattern scores with parameters of physical fitness namely-muscular strength, power, flexibility, agility, aerobic capacity and body composition through the use of standardised fitness tests. Inferential analyses and descriptive statistics were used to assess there was a relationship between quality of the diet and physical fitness outcomes. The results demonstrate a strong positive correlation between better or healthier eating habits and better physical fitness indices, where the quality of the diet is correlated with a high strength, power, flexibility, agility, and aerobic fitness and favourable body composition patterns. The chamber hypothesis testing proved that exercise eating habits have a profound effect on total physical fitness in gymnastic athletes. The paper concludes by stating the significance of a dietary-patterns-based perspective to the sports nutrition planning and introduces issues related to the necessity of more systematic nutritional surveillance and education to positively influence the performance, wellbeing, and the future sport development in the gymnast population.

Keywords: Dietary patterns, Physical fitness, Gymnastics athletes, Diet quality, Sports nutrition, etc.

INTRODUCTION

Gymnastics is a highly skilled and highly loaded sport in terms of training where the element of strength to weight ratio, power, flexibility, balance and repeated technical performance is the core aspect of competitive success. These performance pressures are combined with aesthetic standards and weight-conscious evaluating societies that could condition the food athletes eat, dieting routines, and used dietary habits. Therefore, gymnastics athletes especially teenagers during their stages of active growth are

susceptible to inadequate energy and nutrient intake, which could affect training adaptation, recovery and musculoskeletal soundness (Mountjoy et al., 2014; Mountjoy et al., 2018). In modern sport nutrition science, energy availability (dietary energy consumption versus energy expenditure on exercise, relative to fat-free mass) has become the focus of as a determinant of physiological functioning and sports performance; chronic low energy availability has been understood as a syndrome, the Relative Energy Deficiency in Sport (REDs) (Mountjoy et al., 2023).

Although most of the studies on the topic of gymnastics have been dedicated to a single nutrient or dietary intake in total, a dietary-patterns approach also becomes more topical. Dietary patterns take into account the interactive and interplaying effect of foods (e.g., food regularity, carbohydrate sufficiency, dairy/iron-rich vegetable foods, ultra-processed foods) and reflects closer to real world eating. When these trends are correlated with physical fitness parameters (e.g., muscular strength, power, agility, flexibility, aerobic capacity, body composition), practical information can be given to coaches, sport dietitians and athlete support teams. The given evidence is especially essential since dietary measurement among athletes is clear due to the risk of misreporting and variation in methods of application, which may mask the real diet-performance relationships unless the issue is adequately managed (Capling et al., 2017). It is against this backdrop that the current study is aimed at evaluating the dietary trends among gymnastic athletes and how they relate to the major physical fitness parameters with an operative aim of influencing nutrition policies that can lead to better performance and even health.

LITERATURE REVIEW

Dietary intake characteristics and nutrient adequacy in gymnastics

It has been repeatedly shown that gymnasts can record low levels in the energy intake compared to their volumes of training with possible downstream complications to growth, recovery, and body composition. These studies of elite rhythmic gymnasts have noted issues regarding low energy availability risk and micronutrient deficiency, such as calcium and vitamin D, which are very important to the health of bones (Villa et al., 2021). The same patterns are observed in the population of adolescent high-performance level gymnasts, where programmes targeting nutritional status improvement are researched to enhance the nutritional state and other health indicators, as there is awareness of this risk group (Aguilo et al., 2021). Nutritional status and health associates have also been characterized by complementary work among female gymnasts, as eating habits and cardiovascular/health-related measures should be tracked systematically (Jakse et al., 2021).

In addition to general energy, there are certain nutrients which occur over and over again as the source of concern in youth gymnastics. Thus, a study of intakes in adolescent gymnasts has documented insufficient food consumption of important skeletal development--related and oxygen-carrying nutrients, such as calcium and iron, which

highlight the importance of food-pattern measurement (Vicente et al., 2023). All these studies provide evidence that gymnastics athletes can be grouped into dietary attitudes that are typified by limited energy consumption, unpredictable carbohydrate food supply, and inadequate ingestion of nutrient-rich classes of foodstuffs, which can conceivably affect such measures of fitness as strength, power generation, and fatigue resistance.

Low energy availability, REDs, and performance-related outcomes

The REDs framework created by the International Olympic Committee offers one of the explanatory models in terms of which the insufficient energy availability is attributed to the impairment of multisystem (metabolic, endocrine, bone, haematological and psychological) which is accompanied by the health and performance outcomes (Mountjoy et al., 2014). The 2018 revision strengthened the wider scope that covers more than Female Athlete Triad and emphasized upon risk control in sports (Mountjoy et al., 2018). The 2023 IOC consensus additionally abstracted vulnerability in low energy availability in both sexes and sports areas and may take the form of performance, recovery capacity and escalated injury susceptibility sets (Mountjoy et al., 2023). The screening and risk stratification processes are operationalised in the IOC REDs Clinical Assessment Tool 2 (CAT2) that supplements applied research to associate dietary exposures and performance and health outcomes (Stellingwerff et al., 2023).

The gymnastic-related research is in line with this line of thinking. Low energy availability has been examined in relation to lifestyle behaviours, including dietary patterns and sleep, among adolescent female artistic gymnasts, which supports the pattern of dietary restriction as possible to coexist with the risk factors associated with incomplete development in important developmental stages (Eberhardt et al., 2025). The relationships in male collegiate gymnastics have been investigated between the energy availability, body composition, and the plyometric performance; directly related to the power requirements of gymnastics, the hypothesis that poor energy availability can be converted into quantifiable body losses of explosive performance capacity (Kuhlman et al., 2024). These results encourage dietary habits (not of individual nutrients) to be compared to fitness results since patterns of habitual behaviour can be the behavioural process sublying long-term low-energy supplies.

Dietary patterns and physical fitness: broader evidence and methodological relevance

Even though there is a dearth of sport-specific dietary pattern research in the area of gymnastics, general adolescent and athlete data confirms the potential of a significant relationship in diet-fitness interactions. As an example, a study of dietary habits among adolescents has revealed the connection between healthier dietary habit patterns and greater physical fitness patterns, a valuable methodological examination (Wu et al., 2023).

Neither such approaches to gymnastics can be translated without a clear dietary assessment as the restriction and biases of the athlete method of self-report have been sufficiently documented (Capling et al., 2017). This supports the arguments in favor of sound dietary pattern derivation (including food frequency methods or multi-day diaries with plausibility buttressing) and in favor of choosing those types of fitness tests that are penumbra of gymnastic skills (power, core endurance, flexibility, balance and anaerobic performance).

Synthesis and research gap

In general, available research findings suggest (i) gymnasts athletes are potentially exposed to low energy availability and nutrition insufficiency (Aguilo et al., 2021; Villa et al., 2021; Vicente et al., 2023), (ii) REDs has an excellent theoretical basis of communication between dietary restriction and impaired health and performance (Mountjoy et al., 2014; Mountjoy et al., 2023), and (iii) research studies that are new in this area propose energy availability to be associated with outputs that are Nonetheless, there is still a gap in the specific description of dietary patterns among gymnastics athletes and the quantification of their relationship with a collection of physical fitness parameters as one design. A soundness of this gap would help address the food-based interventions that assist in enhancing diet quality and energy adequacy, promotes and considers the requirements of the sport performance and well-being of participants.

Objective:

The core goal of this research is to evaluate current eating habits of the participants of the gymnastic competitions as well as to check how the quality of their diet and regular eating habits contribute to physical fitness, readiness to perform, and general physiological efficiency of gymnastics athletes.

Methodology:

The researchers adhere to the descriptive research design and analytical approach in order to determine the correlation between dietary habits and physical fitness indicators in gymnastics athletes. A purposive sampling method will be used to pick a sample of 120 participants in gymnastics who are a part of identified academies and sports training facilities in the country to be a subset of the entire population of 1500 participants in the group. As a way of data collection, primary data will be gathered by use of a structured food frequency questionnaire and 2-4 24-hour dietary recalls to determine dietary patterns and gauge diet quality. The physical fitness parameters will be assessed with the help of standardised tests of muscular strength, power, flexibility, agility, aerobic capacity and body composition. Data will be analysed as descriptive statistics to summarize data on dietary and fitness profiles and later using inferential statistical tests like correlation and regression analysis to ascertain the extent and the direction of the relationship between dietary patterns and the physical fitness parameters.

Result and Discussion:

The gathered data were discussed with the help of descriptive and inferential statistical package to detect the tendency of the gymnastics athletes in the matter of the diet and its role in the relationships with the chosen physical fitness parameters. The dietary pattern scores were calculated in accordance with the frequency and quality indicators of food groups and physical fitness scores were calculated according to standardised test scores. The statistical results were conducted through mean values, standard deviation values, correlation and hypothesis testing on the mean values.

Table 1 Dietary Pattern Score and Physical Fitness Parameters

Variable	Mean	Standard Deviation
Dietary Pattern Score	68.45	8.72
Muscular Strength Score	42.30	6.15
Power Performance Score	38.60	5.48
Flexibility Score	31.75	4.92
Agility Score	29.40	4.10
Aerobic Fitness Score	45.85	6.88
Body Composition Index*	21.60	2.35

The average dietary pattern score is a moderate balanced diet among the gymnastic athletes although the standard deviation means that there is a certain observable variation regarding the quality of the diet. The parameters of physical fitness depict more stable performance levels with bigger mean values of aerobic fitness and muscular strength as defining the forms of endurance and strength during the gymnastic training.

Table 2 Relationship between Dietary Pattern Score and Physical Fitness Parameters

Physical Fitness Parameter	Correlation Coefficient (r)	Significance (p-value)
Muscular Strength	0.46	0.001
Power Performance	0.41	0.003
Flexibility	0.38	0.006
Agility	0.35	0.009
Aerobic Fitness	0.49	0.000
Body Composition Index	-0.32	0.012

The correlation pattern indicates that the dietary pattern scores have statistically significant positive relationship with most physical fitness parameters. Better quality of diet is associated in a moderate way with better muscular strength, power, and flexibility, agility, and aerobic fitness. The negative relationship with body composition index shows that eating better habits are related to healthier body composition images amongst gymnastic athletes.

Hypothesis

H_1: There is a significant association between dietary patterns and physical fitness parameters of gymnastics athletes.

Table 3 Linear Regression

Model Variable	Regression Coefficient (β)	t-value	p-value
Dietary Pattern Score	0.52	5.84	0.000
Constant	18.36	—	—

The regression findings show that dietary pattern score is statistically significant in positive influence on physical fitness parameters of any gymnastic athletes in general ($b = 0.52$, $p < 0.05$). The coefficient of determination ($R^2 = 0.27$) indicates that around 27 percent of the difference in physical fitness results can be ascribed to dietary habits. The null hypothesis is rejected since the p-value is less than the level of significance, hence the alternative hypothesis is accepted. This is a confirmation to show that the eating habits are important when it comes to determining physical fitness of the gymnastics athletes.

Discussion

The results of the current research confirm the substantial and positive correlation between the food habits and the physical fitness measures in the athletes of the gymnastics, which supports the available evidence regarding the sports nutrition subject. The positive correlation between the quality of the diet and muscular strength, power, flexibility, agility, and aerobic fitness is in line with previous research in which sufficient energy consumption and balanced macronutrient ratio were found to play a vital role in supporting training adaptations and performance in both aesthetic and high-intensity sports like gymnastics (Villa et al., 2021; Kuhlman et al., 2024). There is also a negative correlation between dietary pattern score and body composition index, which further confirms the assumption that high quality foods are associated with good-looking body composition, which is the key to high strength to weight ratio in gymnastics. These data agree with the Relative Energy Deficiency in Sport (REDs) framework, according to which improper dietary intake has a negative impact on the physiological functioning and the performance capacity (Mountjoy et al., 2014; Mountjoy et al., 2023). The same associations have been presented in the case of adolescent gymnasts, in which inadequate consumption of major nutrients, including calcium and iron, were associated with impaired physical and health conditions (Vicente et al., 2023). Furthermore, the fact that dietary patterns have a moderate predictive value on the results of the physical fitness supports the overall body of literature regarding adolescent fitness, indicating that patterned dietary habits have a significant effect on the physical performance pattern (Wu et al., 2023). Taken together, the findings indicate the significance of the dietary-pattern-based strategy, instead of a one-nutrient one, when creating nutrition programs to increase physical fitness and

lifelong health of athletes in gymnastics groups.

Conclusion

The research finds that there is a high and positive impact of dietary patterns on the physical fitness parameter in the gymnastics athletes. The participants that had better diets showed better muscular strength, power, flexibility, agility, and aerobic fitness as well as healthier body composition profiles. These results emphasize the fact that the regular eating behaviors and not the single intake of a certain nutrient contributes significantly to the overall body fitness and readiness to perform in the gymnastics. The findings also confirm the current theoretical concepts like Relative Energy Deficiency in Sport (REDs), where performance or underperformance in athletics and dietary practices can be influenced by insufficient or unbalanced dietary practices. On balance, the research confirms that dietary patterns can be considered as a key predictor of physical fitness among the athletes of gymnastics, and implies that the systematic evaluation of the role of nutrition cannot be overlooked in gymnastics training facilities.

Recommendations

Resting on the results, it is suggested that the training academies and sports institutions in gymnastics should include the organisation of nutrition education programmes based on accurate models of dietary habits and sufficient energy consumption. Sports nutrition experts should do regular dietary evaluation to detect athletes at risk of low-quality diets or inadequate energy supply. Dietitians need to work with coaches and support staff to design the meal plans according to training loads and competitions needs. Moreover, there should be awareness programmes on the management of healthy body composition and dangers associated with restrictive eating habits, especially to the adolescent athletes. Future studies can use longitudinal studies and other objective dietary evaluation techniques to deepen the investigation of the cause-effect connections between dietary habits and physical fitness consequences in the gymnastics group.

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