COMPARATIVE ANALYSIS OF MACRONUTRIENT INTAKE IN YOUTH FOOTBALL PLAYERS UNDER STRUCTURED AND FREE-LIVING DIETARY CONDITIONS

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Introduction. Adequate nutrition in youth football must support two simultaneous demands: the energy cost of regular training and the physiological requirements associated with growth and biological maturation [1,4]. These demands are not constant throughout adolescence, because energy expenditure, body size, fat-free mass, and maturation status change as academy players progress through age groups [2,4]. Therefore, evaluating dietary intake only by chronological age may not fully reflect the nutritional needs of young football players [2,4].

The organization of daily nutrition may also influence the pattern of nutrient intake. Studies of youth football players have shown substantial variation in daily energy and macronutrient intake, including differences in carbohydrate, protein, and fat consumption across training periods and age groups [5,9]. In a structured dietary setting, meals are planned and provided according to an established schedule, whereas players in free-living conditions depend more heavily on family meals and individual food choices. The practical question is not simply whether one setting provides more food, but whether the resulting macronutrient profile corresponds to the physiological and training-related demands of the athlete [1,2,10].

The aim of this study was to compare carbohydrate, protein, and fat intake in youth football players under structured and free-living dietary conditions, taking biological maturation stage and playing position into account.

Materials and Method. The study included 120 male youth football players aged 12–17 years. The participants represented two dietary environments: a structured setting with organized meal provision and a free-living setting in which daily food intake was primarily organized outside the football academy.

For analysis, the players were classified into three maturation-related age groups: 12–13 years (Pre-PHV), 14–15 years (Circa-PHV), and 16–17 years (Post-PHV). Playing position was considered separately for defenders, midfielders, and forwards. Goalkeepers were not included in the position-specific analysis.

Daily dietary intake was evaluated using recorded food-consumption data, and the amounts of carbohydrate, protein, and fat were calculated for each maturation stage and playing position. Macronutrient intake was examined both as absolute daily intake and, where required for interpretation, relative to body mass. The primary comparison focused on differences between the structured and free-living dietary conditions within corresponding maturation and positional categories.

Results. Distinct differences in macronutrient intake were observed between the two dietary conditions. Across the analyzed maturation stages and playing positions, players in the free-living setting consistently consumed more carbohydrate and fat, while their protein intake was lower than that of the corresponding players receiving structured nutrition.

In the Pre-PHV group, carbohydrate intake under structured conditions ranged from 350 to 360 g/day, compared with 380–400 g/day in the free-living setting. Protein intake ranged from 75 to 92 g/day under structured nutrition and from 65 to 82 g/day under free-living conditions. Fat intake showed the

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opposite pattern, ranging from 65 to 72 g/day in the structured setting and 75 to 88 g/day in the free-living setting.

The same direction of difference was maintained during the Circa-PHV stage. Structured dietary conditions provided 400–430 g/day of carbohydrate, 90–112 g/day of protein, and 70–80 g/day of fat. In the free-living group, the corresponding ranges were 450–480 g/day, 80–102 g/day, and 80–98 g/day, respectively. Thus, the period associated with active biological maturation was characterized not simply by differences in total macronutrient intake, but by a different distribution of protein, carbohydrate, and fat between the two dietary environments.

Among Post-PHV players, carbohydrate intake reached 450–490 g/day in the structured setting and 500–530 g/day under free-living conditions. Protein intake was 100–122 g/day and 90–112 g/day, respectively, whereas fat intake increased from 75–88 g/day under structured nutrition to 85–108 g/day in the free-living setting.

A consistent pattern was therefore present across all nine combinations of maturation stage and playing position. Compared with the corresponding structured-diet groups, free-living players consumed approximately 30–50 g/day more carbohydrate and 10–20 g/day more fat, while protein intake was 10 g/day lower in each corresponding subgroup. However, the magnitude and nutritional relevance of these differences varied according to maturation stage and playing position.

Discussion. The findings indicate that the main difference between the two dietary environments was not a uniform reduction or increase in food intake. Instead, the free-living dietary pattern was characterized by a shift toward higher carbohydrate and fat intake accompanied by lower protein intake. This distinction is important because nutritional adequacy in adolescent athletes depends on the relationship between dietary intake, growth and maturation, body size, and training demand, rather than on the absolute quantity of food consumed alone [1,4,10]. Previous studies in youth football have likewise shown that macronutrient intake can vary considerably and may not always match estimated energy or carbohydrate requirements [5,9].

The differences were particularly relevant when biological maturation was considered. During adolescence, changes in body size, fat-free mass, resting metabolic rate, growth, and football-related energy expenditure can alter nutritional requirements [2,4]. Consequently, identical dietary recommendations for all players of the same chronological age may overlook meaningful differences associated with maturation and individual training demands [1,4].

The results also suggest that a structured dietary environment may provide greater control over macronutrient distribution, whereas free-living nutrition can produce a different nutrient profile even among players participating in comparable football training. Nevertheless, the present comparison should be interpreted as an association between dietary environment and observed intake patterns, rather than evidence that the dietary environment alone caused these differences.

Conclusion. Youth football players living under structured and free-living dietary conditions demonstrated different patterns of macronutrient intake across Pre-PHV, Circa-PHV, and Post-PHV stages. Free-living nutrition was consistently associated with higher carbohydrate and fat intake and lower protein intake compared with structured nutrition. These findings support the assessment of young football players' diets according to biological maturation stage, playing position, and individual nutritional requirements, rather than relying solely on chronological age or a uniform team-based dietary approach.

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