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# The relationship between exercise parameters, body weight, and nutritional habits of junior handball players

## Stabilirea unei relații între parametrii de efort, greutatea corporală și obiceiurile nutriționale ale unor tineri handbaliști

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**Abstract**

*Background.* It is known that young athletes have different nutritional needs than adults. During training, between the period of accumulation and the period of growth, a balance must be established in order to obtain the best physical parameters.

*Aims.* To assess the relationship between proper food ingestion and physical activities efficiency.

*Methods.* A cross-sectional qualitative study was conducted to assess the physical parameters of pupils from the Olympic Sports Club in Târgu Mureș in 2015. A sample of 57 players, members of the handball team, aged 10-16, were questioned. The results were analyzed using the Chi-square test.

*Results.* Significant differences were found between the exercise parameters, exercise duration (p=0.0001), intensity (p=0.018), body mass index (p=0.028) and age of the athletes (p=0.0001). A significant difference was also found between the weight of athletes and the intensity of exercise (p=0.0001). All data were evaluated in relationship with the daily consumed meals, percentage distribution of the intake and food consumption.

*Conclusions.* We have identified a relationship between food consumption and exercise parameters. For young athletes, the daily food intake plays a significant role in achieving a high level of training within a minimum of 240 minutes per week at high effort parameters.

**Keywords:** nutrition, athletes, exercise, physical parameters.

**Rezumat**

*Premize.* Tinerii sportivi au nevoi nutriționale diferite față de adulți. În pregătire, între perioada de acumulare și perioada de dezvoltare, obținerea unui echilibru, spre dobândirea parametrilor fizici corespunzători, este obligatorie. Buna dezvoltare a organismului, în relaționare cu efortul sportiv, va fi obținută prin crearea unui plan adecvat de alimentare.

*Obiective.* Identificarea unei conexiuni între consumul alimentar optim și activitatea sportivă specifică.

*Metode.* A fost inițiat un studiu transversal epidemiologic, calitativ, pentru a evidenția relaționarea dintre consumul alimentar al unui grup de sportivi și parametrii de efort fizic. Un lot de 57 sportivi, din cadrul unui club sportiv de handbal, Tîrgu Mureș, România, cu vârste cuprinse între 10-16 ani, au fost chestionate, preluându-se totodată informațiile efortului prestat.

*Rezultate.* Date semnificativ statistic au fost obținute între parametrii de efort, durata activității prestate (p=0,0001), intensitatea (p=0,018), IMC (p=0,028) și vârsta sportivilor (p=0,0001), greutatea corporală a subiecților fiind relaționată cu intensitatea efortului prestat (p=0,001). Toate datele au fost analizate/interpretate în relație directă cu aportul energetic, distribuția realizată și alimentele utilizate.

*Concluzii.* A fost identificată o relație între alimentație și parametrii efortului fizic. În cazul tinerilor sportivi, consumul alimentar zilnic trebuie să stabilească un echilibru energetic astfel încât să se obțină masa corporală dorită. Totodată, consumul alimentar poate influența nivelul de pregătire impus pe parcursul unei săptămâni, prevăzute cu un minim de 240 minute, petrecute la un nivel crescut al acțiunii sportive.

**Cuvinte cheie:** nutriție, tineri sportivi, intensitate, frecvență, parametri fizici.

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## Introduction

Cyclicality of sports activity, particularly in the case of young athletes, can influence the development of the body (Dahab et al., 2009). The nutritional practice of the individual, based on a program in accordance with the individual's energy needs, will represent and meet the energy requirements, which will allow to improve physical parameters (Cotunga et al., 2005).

The intensity, volume and duration of exercise are indicators that characterize the complexity of sporting activities. In the medical field, they can indicate direct evidence of specific losses of nutrients, which are mainly provided in the form of micronutrients, liquids, and macronutrients as energy sources. From another perspective, scientific studies have not highlighted the changes that the athlete's body weight can undergo during the specific sports activity (Jakicic et al., 2009). Basic information suggests changes in the total volume of work performed at high intensity. The fact is that this form of effort (based on intensity) is represented by speed, a motor quality developed naturally (Markovic et al., 2007) and improved by specific training. Furthermore, changing this effort parameter through the body mass may be influenced by the interaction between the individual's motor qualities and body weight. Furthermore, correlations have been mentioned between the body weight and the increase of the total average time spent in high-intensity effort (Marquet et al., 2013).

However, the way in which nutrition influences the specificity of effort seems to be related to food complexity and sports nutrition practice (Beck et al., 2015). All the information is based on the daily actions and preparation carried out to recover the body after physical effort (Daneshvar et al., 2013).

## Hypothesis

Initiating this study took into account the level of practicability in sports activities under various conditions, influenced by nutrition practice. Moreover, we believe that certain connections between the athlete's body weight and specific activity have not been described in detail. We aim to define and differentiate the activities based on the athlete's body weight and the game tasks for each individual.

## Material and methods

*Research protocol*

A cross-sectional qualitative study was conducted after the approval of the University Ethics Committee and the subjects' informed consent to participate in the study were obtained. We aimed to identify the relationship between the dietary practices of a group of athletes and physical effort parameters.

*a) Period and place of the research*

The study was performed between February-March 2015, at the Olympic Handball Sports Club, from Târgu Mureş, Romania.

*b) Subjects and groups*

A sample of 57 athletes, members of the team, aged between 10-16 years, were enrolled in the study.

*c) Tests applied*

Data extraction was carried out by using a questionnaire (17 question items) that included terms of food consumption. The primary objective was to establish connections between dietary habits and sports activities and secondarily, to determine the impact of body weight on handball specific activity. The sports tests used to obtain the effort information were: long jump from standstill, handball ball throwing, 30 meter shuttle, 40 meter shuttle, 50 meter running.

*d) Statistical processing*

Data processing was based on descriptive statistics, using the EpiInfo 6.0 test, in a representative sample. The Chi-square test was chosen to interpret nutritional differences in relation to the sport activity performed, effort parameters and daily nutritional intake.

## Results

The distribution and development of training took into account the subjects' age. A total of 240 minutes per week were spent in effort by athletes aged between 10-12 years. 300 minutes were spent in effort by athletes aged 12-13 years, and over 300 minutes of activity were associated with specific training of athletes aged between 14-16 years.

In relation to the effort performed (60 minutes daily), we highlighted the main meal consumption frequency during the day: breakfast (85%), snack 1 (73%), lunch (98%), snack 2 (66.1%), dinner (87.5%). These results were related to the full program which included a minimum of 240 minutes per week in effort and a maximum of 360 minutes per week, depending on the individual's age.

The specificity of effort was influenced by the perception of athletes and their daily effort. As a result, the intensity of sports activity was presented differently by athletes (Fig. 1), compared to the schedule reported by coaches (Fig. 2).

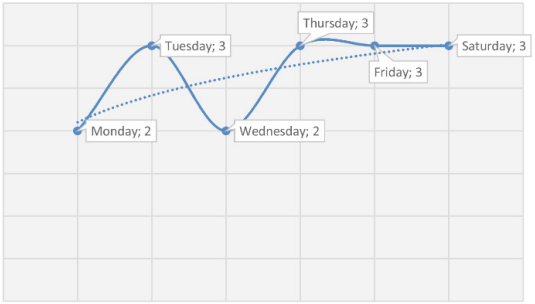


**Fig. 1** – Exercise intensity reported by athletes.

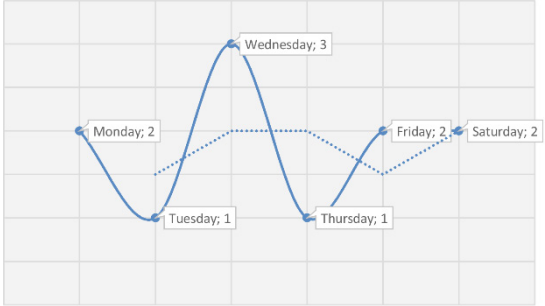


**Fig. 2** – Exercise intensity reported by coaches.

The reports suggested statistical differences between the intensity of effort performed and food consumption. Data were associated with sports activity on four distinctive days: Monday (p=0.007), Wednesday (p=0.003), Friday (p=0.0001), and Saturday (p=0.0001). The most prevalent dietary changes were associated with secondary meals (snacks) on 3 distinct days: Tuesday, Thursday, and Friday, which were entirely related to high-intensity effort: Tuesday (intensity characterization equal to 70-85% of total capacity), Thursday (intensity characterization equal to 70-85% of total capacity), Friday (intensity characterization equal to 70-85% of total capacity).

As a result, the most common changes in food consumption were negative in terms of nutrition. Athletes had an additional intake of simple carbohydrates without an association with the sports activity (Table I).

**Table I**
Possible snack frequency associated with changes in food consumption.

| Food that may be associated as snacks | Daily consumption percentage of the product |
|---|---|
| Yogurt | 30.4% |
| Sweets | 55.4% |
| Crackers | 7.1% |
| Fruit juice | 19.4% |
| Fruits | 56% |
| Oleaginous fruits | 1.8% |
| Apricots, raisins | 7.1% |

These habits and changes in food consumption could have negative effects on the athletes' body mass and specific effort parameters in handball such as those analyzed. The average values obtained for the parameters were as follows: long jump from standstill - 1.76 m, handball ball throwing - 26.76 m, 30 meter shuttle - 4.99 seconds, 20 meter shuttle - 3.45 seconds, 50 meter running - 7.53 seconds.

These data can indicate the level of specificity in the activity of athletes. Therefore, there were statistically significant correlations between age and specific activity data such as the following: long jump from standstill (p=0.018), 50 meter running (p=0.0001), 20 meter shuttle (p=0.0001), 30 meter shuttle (p=0.0001).

The days characterized by athletes as highly intensive: Thursday (p=0.40), Friday (p= 0.0001) and Saturday (p=0.0001) were significantly correlated with the specific physical data collected. As a result, significant differences in the specific activity were obtained, by lowering the total level of effort (running, shuttle, handball ball throwing, total resistance in exercise) on the days with high intensity effort reported by athletes.

The monitored physical data revealed a number of correlations between specific activity and total effort time, based on 5 sporting efforts: long jump from standstill (p=0.002 - positive correlation), handball ball throwing (p=0.056 - positive correlation), 30 meter shuttle (p=0.001 - negative correlation), 20 meter shuttle (p=0.002 - negative correlation), 50 meter running (p=0.0001 - negative correlation). This information highlights in this case the efficiency of handball activity with the increasing effort time.

Additionally, nutrition knowledge and practice were correlated with the effort specific parameters analyzed. The long jump showed a significant relationship with the body mass index of the athletes (p=0.028). Nutritional practice evidenced a statistically significant difference with the activity involving ball throwing (p=0.045), a parameter related to individual power. In this case, the shuttle (p=0.002) was characterized as a parameter related to the athlete's speed in different circumstances.

All nutritional knowledge influences through the daily practice and the body weight a specific activity such as throwing (p=0.029) and running (p=0.022). In addition, the body weight tends to change, for the most part, the activity studied.

## Discussion

The obtained data confirm the hypotheses discussed at the beginning of this paper. The activity expressed through speed specificity is correlated with the total time in which the quality level of the activity can be maintained at a high average point. The longer the activity time, the lower the reported level of speed action is, reaching medium/low effort parameters. On the other hand, activities whose specificity is expressed by power have a favorable short high-intensity period of activity, with a low chance of being maintained at a high level over a long period of time (Knechtle et al., 2015). Moreover, the two motor qualities are intertwined to form motor acts (Sayers et al., 2012). Among them, we can highlight a number of specific technical actions that can be maintained at a high level over short periods of time, divided into sets and reps: speed running, weight lifting, handball specific technical activity (dribbling, ball throwing, passing, defense-specific technical activity) (Wagner et al., 2014).

Along with the total activity time, the specific handball effort, individual body weight, and proper training activity will complete this series of factors (Maciejczyk et al., 2015). As a result of the data obtained, it can be reported that increased body weight tends to have a positive influence

**Table II**
Influence of the activity depending on effort specificity.

| | Long jump from standstill | Running 50 m | Shuttle 20 m | Shuttle 30 m | Handball ball throwing |
|---|---|---|---|---|---|
| Long jump from standstill | - | p=0.0001 (-) | p=0.0001 (-) | p=0.0001 (-) | p=0.009 (+) |
| Running 50 m | p=0.0001 (-) | - | p=0.0001 (+) | p=0.0001 (+) | p=0.0001 (-) |
| Shuttle 20 m | p=0.0001 (-) | p=0.0001 (+) | - | p=0.0001 (+) | p=0.010 (-) |
| Shuttle 30 m | p=0.0001 (-) | p=0.0001 (+) | p=0.0001 (+) | - | p=0.0001 (-) |
| Handball ball throwing | p=0.009 (+) | p=0.0001 (-) | p=0.010 (-) | p=0.0001 (-) | - |

on handball ball throwing and a negative influence on running speed and overall resistance effort (Maciejczyk et al., 2014). A mean body weight positively affects speed and resistance activities (shuttle, long jump from standstill, running speed, general resistance in exercise) (Knechtle et al., 2014), while a low body weight (BMI ≤19) will negatively affect the specific force activity parameters along with similar effort performed.

Additional data are presented in Table II. It can be seen that activities based on power are negatively correlated with activities based on speed. Therefore, a hypothesis supported by various studies addresses the relationship between increasing levels of activity in effort exclusively based on power and decline in activity based only on speed (Sayers et al., 2012). This aspect is also influenced by the body weight. A high average BMI value (BMI - 25 to 29.9 – with a body mass imbalance) will decrease activity based exclusively on speed, facilitating actions influenced by power, if the effort is of such kind.

From this point of view, an important role is the differentiation of muscle power (Candow et al., 2012) and muscle mass among athletes, which is entirely feasible after adolescence. Establishing the influence of body mass on activity is important for individualizing work and game tasks during action (Maldonado et al., 2002). Changing food intake depending on the activity is a primary action. However, most often, this is done incorrectly, on the basis of the individual's fatigue status. The presence of appetite loss within a short period of effort completion and first main meal served shortly after the effort represent the most common causes of these actions (Kellmann, 2010). The food type commonly used by athletes includes features such as: increased GI value, increased energy and macronutrient imbalance, and/or their absence, together with the lack of micronutrients.

## Conclusions

1. Determination of body mass is important in sports activity. Establishing a number of connections between sporting activity and body weight may indicate the importance of body weight and its influence on activity. However, the data identify a connection between increased body mass, strength and speed, being influenced by their specificity.

2. The nutritional knowledge of athletes affects nutritional practice that provides the decisions made in different states that are reported in daily sports activities, including recovery.

3. Stabilizing body weight as well as nutritional intake and imposing an individualization of the training activity depending on the required characteristics are necessary.

**Conflicts of interest**

There are no conflicts of interest regarding the results, research method used or conclusions drawn.

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