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ORIGINAL STUDIES

Lifestyle and cardiovascular health: opinions and behaviors among adults having relatives with cardiovascular diseases

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Abstract

Background. Assessment of opinions and behaviors related to cardiovascular diseases (CVD) prevention is needed in order to develop appropriate interventions for CVD prophylaxis.

Aims. The study aims to assess the opinions and behaviors related to a healthy lifestyle and CVD prevention among Romanian adults who have relatives with cardiovascular diseases.

Methods. The study was performed in 2 hospital settings from Cluj-Napoca, Romania and involved 180 adults (90 men and 90 women) who had relatives with diagnoses of CVD. Data were collected through anonymous questionnaires, and height and weight were measured.

Results. The results show that a percentage of 58.3% of the adults had a body mass index higher than 24.9 and one quarter of the subjects declared that they do not perform at least 30 minutes of physical activity each day. With respect to alimentary habits, 78.3% of the study sample declared eating less than 3 portions of fruits and vegetables/day, while only 8.3% fulfilled the recommendations to eat at least 5 portions of fruits and vegetables per day. Nevertheless, 46.1% intend to eat more fruits and vegetables in the next month. 26.1% of the subjects were smokers (smoked in the last week), while 31.9% of the smokers declared that they would like to quit smoking in the next 6 months. The majority of the participants declared that they would like to receive more information and education regarding healthy lifestyle promotion and CVD prevention.

Conclusions. The results underline the need for appropriate screening, assessment, education and counseling of adults which have CVD patients in their family in order to detect and correct CVD risk factors.

Keywords: healthy lifestyle; cardiovascular disease prevention; adults having relatives with cardiovascular disease.

Introduction

According to Eurostat data, diseases of the circulatory system are one of the main causes of mortality in each of the European Union Member States (EU MS). In 2014, they caused 1.83 million deaths in EU MS; they accounted for 50-60% of all deaths in the Baltic Member States and Romania (1).

Diseases that affect the heart and vessels or cardiovascular diseases (CVD) have both non-modifiable risk factors (e.g. gender, age, genetic factors, ethnicity,) and modifiable risk factors (such as blood pressure, lipid and lipoprotein levels, body weight, nutritional habits, smoking behavior) (2); (Cannon, 2008; Zhang et al., 2018).

There is substantial evidence that health promotion activities targeting the modifiable risk factors can prevent or reduce CVD (2); (Cannon, 2008; Zhang et al., 2018); (3). Hence, the World Health Organization (WHO) emphasizes the need of measures and activities at different levels in order to prevent and reduce active and passive smoking, to promote healthy nutrition, an active lifestyle and moderate consumption of alcohol, maintaining mental well-being for important benefits for CVD prevention and management, as well as for the prevention and reduction of other chronic diseases, such as different forms of cancer, diabetes, respiratory diseases (3).

Through exercise (30 minutes of moderate to vigorous-intensity activity on most days of the week), maintenance of appropriate body weight (a body mass index less than 25), proper diet (consumption of at least 400 g of fruits
and vegetables, consumption of fish minimum 2 times per week, reduced consumption of saturated fats and trans fatty acids, appropriate consumption of dietary fibers daily, reduction of dietary sodium intake) and a smoke-free lifestyle, an individual can decrease the risk for developing CVD (3); (Piepoli et al., 2016).

Hypothesis

This study focuses on Romanian adults who have relatives with CVD and aims to assess their opinions and behaviors related to healthy lifestyle and cardiovascular disease prevention, as a first step in order to develop appropriate interventions for CVD prophylaxis.

Material and methods

Research protocol

a) Period and place of the research

The study was performed in 2011, in 2 hospital settings from Cluj-Napoca, Romania. Approval for the study was obtained from the medical doctors in charge of the patients from the clinic units where the study was performed, an accepted procedure at the time when the study was performed. The study subjects were relatives of patients from hospitals with diagnoses of cardiovascular diseases and were contacted for participation in the study during their presence in the hospital for accompanying or visiting their relatives. Informed oral consent for participation was obtained from all participants.

b) Subjects and groups

The study involved 180 adults (90 men and 90 women) who had relatives with diagnoses of CVD and visited these relatives in the hospital during their stay there for checks or treatment. The participants received information from medical students regarding the study and the fact that participation was voluntary and implied completing an anonymous questionnaire and the measurements of height and weight. The persons who refused to participate were replaced with other relatives of the hospitalized patients. Persons who accepted to participate filled in the anonymous questionnaire. The final sample included 52.2% persons up to 45 years of age and 47.8% older, 36.7% from rural areas and 63.3% from urban areas, while the educational level was the following: 23.3% low, 41.1% medium, 35.5% high.

c) Tests applied

Anonymous questionnaires assessing several lifestyle behaviors were filled in by all the participants; their weight and height were also measured and the body mass index was calculated.

The current study presents information collected by means of anonymous questionnaires regarding the following issues:

- Demographic variables: age, gender, residence in urban or rural areas, educational level (1-low, meaning only junior high school or less, 1-medium, meaning only high school, 2-high, meaning university studies or more).
- Opinions regarding the importance of body weight, physical activity, several alimentary habits, active and passive smoking in influencing the risk of CVD.
- Involvement in intense and moderate physical activity, as well as walking; the participants were asked about the number of days on which they performed each of these types of physical activity in the last week and the length of time dedicated to these activities with each occasion.
- Frequency of consumption of different food products (fruits and vegetables, different types of meat, different types of fats, beans, white and dark bread in the last week (less than 1/week, 1-2 times week, 3-4 times/week, 5-6 times/week, daily), as well as of activities such as removing skin from the chicken meat before eating it (never, sometimes, frequently).
- Special attention was given to the consumption of fruits and vegetables, the participants being asked how many days they had consumed fruits and vegetables in the last week and how many portions they had consumed each of these days, being explained that a portion is defined as one medium fruit or one half cup of fruits or vegetables or one cup of raw leafy vegetables (e.g. lettuce), or three-fourths of a cup of vegetable or fruit juice.

At the same time, the participants were asked to indicate if they thought the amount of fruits and vegetables they consumed was enough and if they intended to eat more the next month.
- Exposure to passive smoking in public places and at home in the last week
- Behavior related to active smoking (smoking status, intention to quit in the future among smokers)

Persons who declared smoking in the last week were considered smokers.
- Availability to receive more information and education regarding healthy lifestyle promotion and CVD prevention

d) Statistical analysis

The medium time dedicated to physical activity per day by each participant was calculated using the following formula: \[ \frac{2(EXH)+(FXI)+(GXJ)}{7} \]

Where E - number of days/week when intense physical activity was performed

H - number of minutes of intense physical activity performed on those days

F - number of days/week when moderate physical activity was performed

I - number of minutes of moderate physical activity performed on those days

G - number of days/week when walking was performed

J - number of minutes of walking performed on those days

Similarly to other studies, we considered that 30 minutes of vigorous physical activity were equivalent to 60 minutes of moderate physical activity (4).

The medium number of portions of fruits and vegetables was calculated by multiplying the number of days/week when they consumed fruits and vegetables by the number of portions/day and divided by 7.

The body mass index (BMI) was calculated using the following formula: \[ \frac{\text{weight (in kg)} \times \text{height (in m)}}{\text{height (in m)}} \]; weight was measured in kg and height in m. The following cutoff values for the body mass index were considered: underweight (BMI <18.5), normal (BMI 18.5-24.9), overweight (BMI ≥25), obese (BMI ≥30) (5).

Pearson bivariate correlations were used to assess the associations between socio-demographic characteristics
Opinions regarding the role of lifestyle in CVD prevention

The results show that more than 91% of the study sample recognizes that a high body weight and active and passive smoking increase the risk of CVD, while performance of physical activity decreases the risk (Table I). The majority also know that consumption of fruits and vegetables contributes to prevention of CVD, but only 73% of the participants know that high consumption of animal fat increases the risk of CVD, while less than half know that consumption of food rich in dietary fibers (e.g. dark bread, beans) contributes to prevention of CVD.

BMI and lifestyle-related behaviors

A percentage of 58.3% of the adults had a BMI higher than 24.9. One quarter of the subjects declared that they did not perform at least 30 minutes of physical activity each day.

With respect to alimentary habits, 78.3% of the study sample declared eating less than 3 portions of fruits and vegetables/day, while only 8.3% fulfilled the recommendations to eat at least 5 portions of fruits and vegetables per day. Nevertheless, 52.8% of the participants believed that they should eat more fruits and vegetables, and 46.1% intended to do so the next month.

A percentage of 73.9% of the participants declared eating white bread at least 1-2/week and half of the participants even daily, while 63.9% consumed dark bread at least 1-2 times per week (one third of the participants consumed it daily). Weekly beans consumption was declared by 76.7% of the participants.

On the other hand, 60.6% of the participants declared having eaten fish at least 1-2 times in the last week. The consumption of pork and beef at least 1-2 times weekly was declared by 74.9% and 44.6% of the participants, respectively. A percentage of 90% of the study sample ate chicken at least 1-2 times per week, while 48.3% frequently removed the skin before eating it.

Regarding the consumption of fats, it can be seen that the preferred type of fat was sunflower oil, with 93.3% declaring using it at least once per week and 48.7% even daily. Olive oil was consumed at least 1-2 times per week by 46.3% of the participants. A percentage of 61.1% of the participants consumed butter at least weekly, margarine was consumed at least 1-2 times per week by 47.4% of the adults, while 52% declared consuming the traditional fatty pork bacon at least 1-2 times/week and 26.3% used the pork fat for cooking/eating at least weekly.

The results show that 26.1% of the subjects were smokers (smoked in the last week), while 31.9% of the smokers declared that they would like to quit smoking in the next 6 months.

Exposure to passive smoking in public places in the last week was declared by 29.3% of non-smokers, while 12.5% of non-smoking subjects were exposed to passive smoking in their own houses in the last week.

A percentage of 85.8% of the participants declared that they would like to receive more information and education regarding healthy lifestyle promotion and cardiovascular disease prevention.

Factors which influence behaviors

The results of the bivariate correlation analyses show that there were several differences regarding behavior based on age, gender, residence and educational level (Table II).

Older people had a higher tendency to have a higher BMI, to cook with pork fat, not to avoid chicken skin, while they ate dark bread more frequently and were less involved in active smoking or exposed to passive smoking in public places or in their homes. On the other hand, they were more interested in getting more information about health promotion and cardiovascular disease prevention.

In comparison with men, women performed less physical activity. They declared a stronger intention to consume more fruits and vegetables, consumed olive oil more frequently, and fish and chicken as well as margarine and traditional bacon fat less frequently. They were less involved in active smoking.

In comparison with people from rural areas, people from urban areas declared eating more fruits and vegetables, consuming pork and beef meat less frequently, while using pork fat for cooking less frequently and eating dark bread more frequently. Active smoking was more frequent in urban areas.

<table>
<thead>
<tr>
<th>Opinions</th>
<th>I totally agree/I partially agree %</th>
<th>Do not know %</th>
<th>I totally disagree/I partially disagree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>A high body weight increases the risk of CVD</td>
<td>91.4</td>
<td>6.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Consumption of fruits and vegetables contributes to prevention of CVD</td>
<td>88.3</td>
<td>7.8</td>
<td>3.9</td>
</tr>
<tr>
<td>Consumption of food rich in dietary fibers (e.g. dark bread, beans)</td>
<td>43.9</td>
<td>43.3</td>
<td>12.8</td>
</tr>
<tr>
<td>contributes to prevention of CVD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High consumption of animal fat increases the risk of CVD</td>
<td>73</td>
<td>24.7</td>
<td>2.3</td>
</tr>
<tr>
<td>Performance of physical activity contributes to prevention of CVD</td>
<td>93.3</td>
<td>3.9</td>
<td>2.8</td>
</tr>
<tr>
<td>Active smoking increases the risk of CVD</td>
<td>95.6</td>
<td>4.4</td>
<td>0</td>
</tr>
<tr>
<td>Passive smoking increases the risk of CVD</td>
<td>93.9</td>
<td>5.6</td>
<td>0.5</td>
</tr>
</tbody>
</table>
On the other hand, a higher educational level was associated with a stronger intention to eat more fruits and vegetables, eating butter more frequently and consuming traditional fatty pork bacon or pork fat for cooking less frequently, while removing skin from chicken meat more frequently. People with a higher educational level also expressed a higher interest in finding more information about prevention of CVD.

**Discussions**

More than 93% of the participants know that active and passive smoking have a risk for CVD. Other studies also underline the high level of knowledge of the Romanian population regarding the health effects of smoking (Trofor et al., 2018). One quarter of the participants declared smoking, this habit being more frequent among men and among those from urban areas. Almost one third of the smokers declared their intention to try to quit smoking in the next six months, emphasizing the need for medical counseling for this, in accordance with the results of other studies (Cehab et al., 2018; Vogiatzis et al., 2017). Among non-smokers, 29% declared exposure to passive smoking in public places in the last week and 12% in their own houses, exposure to passive smoking being more frequent among younger non-smokers. The study was performed before the ban of smoking in public places including bars and restaurants, which came into force in Romania in 2016. It might be possible that exposure to passive smoking in public places has since diminished as a consequence of the legislation, as other studies indicated with regard to the effects of comprehensive banning of smoking in public places (Lotorean, 2008).

At the same time, more than 91% of the study sample know that physical activity and maintaining an appropriate body weight contribute to prevention of CVD. Half of the participants had a higher BMI, with older people having a higher tendency to be overweight. This underlines the need for education and counseling activities with regard to body weight management and chronic disease prevention, issues which were also underlined by other Romanian studies performed in different groups of Romanian adults (Lotorean et al., 2016; Lotorean et al., 2013). Three quarters of the participants declared performing at least 30 minutes of physical activity daily, which is a positive issue.

With regard to nutritional habits, the majority of the subjects recognize the importance of consuming fruits and vegetables. Nevertheless, the majority do not consume 5 portions of fruits and vegetables as recommended daily, but almost half declared their intention to eat more the next month. Other studies also emphasized the fact that low consumption of fruits and vegetables is an important issue which should be targeted by educational campaigns, programs and counseling (Lotorean et al., 2016; Lotorean et al., 2013; Slavin & Lloyd, 2012; Zhan et al., 2017).

The study shows the tendency of the majority of the study sample to frequently include in their diet chicken

---

**Table II**

Factors which influence behaviors - results of bivariate correlation analyses.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Age</th>
<th>Gender</th>
<th>Rural-urban</th>
<th>Education level</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI e</td>
<td>0.304</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Physical activity</td>
<td>NS</td>
<td>-0.203</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Portions of fruits and vegetables</td>
<td>NS</td>
<td>NS</td>
<td>0.213</td>
<td>NS</td>
</tr>
<tr>
<td>Intention to consume fruits and vegetables</td>
<td>NS</td>
<td>0.159</td>
<td>NS</td>
<td>0.168</td>
</tr>
<tr>
<td>Frequency of beans consumption</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>-0.247</td>
</tr>
<tr>
<td>Frequency of dark bread consumption</td>
<td>0.273</td>
<td>NS</td>
<td>0.345</td>
<td>NS</td>
</tr>
<tr>
<td>Frequency of white bread consumption</td>
<td>NS</td>
<td>NS</td>
<td>0.309</td>
<td>NS</td>
</tr>
<tr>
<td>Frequency of fish consumption</td>
<td>NS</td>
<td>-0.403</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Frequency of pork consumption</td>
<td>NS</td>
<td>-0.242</td>
<td>-0.149</td>
<td>NS</td>
</tr>
<tr>
<td>Frequency of beef consumption</td>
<td>NS</td>
<td>NS</td>
<td>-0.237</td>
<td>NS</td>
</tr>
<tr>
<td>Frequency of chicken consumption</td>
<td>-0.255</td>
<td>-0.174</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Removing skin from chicken meat</td>
<td>-0.263</td>
<td>NS</td>
<td>NS</td>
<td>0.186</td>
</tr>
<tr>
<td>Frequency of sunflower oil consumption</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Frequency of olive oil consumption</td>
<td>NS</td>
<td>NS</td>
<td>0.230</td>
<td>NS</td>
</tr>
<tr>
<td>Frequency of butter consumption</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>0.214</td>
</tr>
<tr>
<td>Frequency of margarine consumption</td>
<td>NS</td>
<td>NS</td>
<td>-0.334</td>
<td>NS</td>
</tr>
<tr>
<td>Frequency of pork fat use for cooking</td>
<td>0.231</td>
<td>NS</td>
<td>-0.233</td>
<td>-0.347</td>
</tr>
<tr>
<td>Frequency of traditional fatty pork bacon consumption</td>
<td>NS</td>
<td>-0.360</td>
<td>NS</td>
<td>-0.258</td>
</tr>
<tr>
<td>Active smoking</td>
<td>-0.397</td>
<td>-0.162</td>
<td>0.440</td>
<td>NS</td>
</tr>
<tr>
<td>Passive smoking in public places</td>
<td>-0.273</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Passive smoking at home</td>
<td>-0.278</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Want more information</td>
<td>0.217</td>
<td>NS</td>
<td>NS</td>
<td>0.195</td>
</tr>
</tbody>
</table>

From 22 to 80 years old; a- Coded as Men-1; Women -2; b- Coded as Rural-1, Urban-2; c- Coded as Low-1, Medium-2, High-3; d- Coded as 1-Underweight, 2-Normal, 3-Overweight, 4-Obese; e- Coded as less than 30 minutes/day-1, at least 30 minutes per day-2; f- Medium number of portions of fruits and vegetables consumed per day; g- Coded as No-1, Yes-2; h- Coded as less than 1/week-1, 1-2 times/week-2, 3-4 times/week-3, 5-6 times/week-4, daily-5); i- Coded as Never-1, Sometimes-2, Frequently-3; j- Coded as 1-No, 2-Yes; k- Number of days/week; l- Coded as No-1, Yes-2; NS- non-significant (P<0.05).
meat (but only half of these remove the skin frequently) and pork, while fish meat is consumed at least once/week by less than two thirds of the participants and less than half eat beef weekly, with men eating fish and chicken more frequently than women, while people from rural areas eat pork and beef more frequently in comparison with those from urban areas.

The fat preferred for cooking is sunflower oil, while almost half consume or use for cooking at least once per week butter (consumption is more frequent among those with a higher educational level), margarine (men consume more than women), pork fat for cooking (more frequent among people from rural areas and among those with a lower educational level), fatty pork bacon (more frequent among men and people with a lower educational level). On the other hand, less than one out of two participants use olive oil at least once weekly, women tending to consume it more frequently. This situation is probably in relation to gastronomic and cultural influences, but also with the fact that more than one quarter do not know that animal fat increases the risk of CVD, as other studies also suggest (Lotrean et al., 2016). At the same time, consumption of white bread is preferred over consumption of dark bread, which is also in accordance with the gastronomic culture of the region, while less than half of the participants recognize the importance of eating food rich in fibers such as dark bread and beans for CVD prevention.

Conclusions and suggestions

1. The study evaluated the opinions and behaviors of Romanian adults having relatives with CVD with regard to lifestyle and cardiovascular health promotion.
2. The results underline the need for appropriate screening, assessment, education and counseling of adults which have CVD patients in their family in order to detect and correct inappropriate lifestyle and medical conditions.
3. The majority of the participants declared that they would like to receive more information and education regarding healthy lifestyle promotion and CVD prevention, which is an encouraging fact.
4. Efforts should be made to also get access to groups such as people with a lower educational level who seem to be less interested in these types of interventions.

References


Websites


Factors involved in the occurrence of body and head injuries among children of Cluj county practicing ball sports

Sorana Baciu, Marius Manole, Alexandru Grecu, Anca Stefania Mesaroș
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Abstract

Background. Sports dentistry has become very popular lately as the trend of a healthy life increases. Many families are raising their children from an early age in the spirit of a healthy life, and enroll them in team sports in order for them to practice physical activities on a regular basis. Injuries in different parts of the body are encountered in children practicing team sports and more often occur in ball games.

Aims. The objective of this study was to assess the frequency of occurrence of injuries in a group of children practicing ball games (sports group) in Cluj and to compare them with a control group.

Methods. The questionnaire and documents regarding informed consent were distributed to the 1273 families with children practicing basketball and to 1273 families with children that were not involved in regular sports activities.

Results. Our results were comparable with the results in the literature in regard to distribution related to gender, age, number of days of practice, years of experience, hours of rest, location of injuries in the body. Regarding practice days, a lower incidence (6.48%) was found in the sports group (Sg) for children with under 3 days of practice per week compared to children of the Sg with over 3 days of practice (8.4%). For the injured cases, the length of the period of resting time in training influenced the occurrence, not significantly, but nevertheless higher scores for injuries were encountered (49.11%) when no sufficient resting time was granted (50.89%). Another factor influencing the rate of injuries was the sleep duration, for which in children of the Sg, values ranged between 5.49% - 33.93% and 60.66% for 8-9 hours, 7-8 hours and 6-7 hours of sleep, respectively.

Conclusions. We can state that the results are similar to similar studies in the literature, in regard to gender distribution and injury distribution related to different body parts. We found out that the injury rate increased with age and experience in the basketball group, where lower limbs, followed by upper limbs and head were the most injured parts of the body. Insufficient knee and elbow protections were worn, but nevertheless in a higher proportion of cases than mouth guards.

Keywords: ball games, children, injuries, occurrence.

Introduction

People are motivated for a physically active life as different kinds of activities ensure, in addition to maintenance and improvement of fitness and health, socialization, pleasure, relaxation, competition. The disadvantage of practicing different types of sports is the assumed risk for injuries, which may, in some cases, lead to permanent disability (Newsome et al., 2001; Padilla & Balikov, 1993).

An injury has been defined as an incident occurring during a match or training in the club, causing the player to miss at least one match or one training session (Yde & Nielsen, 1989).

Dental trauma associated or not with injuries of the stomatognathic system in sports is the main connection between sports and dentistry. Traumatic dental injuries have become a public dental health problem and sports accidents are included in this category, alongside injuries caused by violence and traffic accidents (Andreasen & Andreasen, 1994).

Sports dentistry has become very popular lately as the trend of a healthy life increases. A physically active lifestyle is important for all age groups (Bijur et al., 1995). Different types of indoor or outdoor activities involve various ages, from children and young adults to persons up to the 6-7 decades of life. Many families are raising their children from an early age in the spirit of a healthy life, and enroll them in team sports in order for them to practice physical activities on a regular basis (Kracher & Smith, 2017; Saini, 2011).
Protective gears have improved over time and they have become more comfortable, user-friendly, and safe (Nielsen & Yde, 1989). Sports dentistry ensures different kinds of treatments for orofacial injuries, as well as prevention of those injuries through different methods (e.g. face shields, mouth guards).

**Hypothesis**

We started from the null hypothesis in our study, namely that there is no difference between the prevalence of dentofacial injuries in a group of children practicing sport (sports group - Sg) in Cluj county compared to a control group consisting of children that do not have organized sports activities (control group - Cg).

**Material and methods**

The present research was approved by the Ethics Committee of the University of Medicine and Pharmacy Cluj-Napoca. Parents provided a written informed consent.

**Research protocol**

a) *Period and place of the research*

The research took place in Cluj-Napoca during February and March 2020.

b) *Subjects and groups*

The participants were children aged 5-12 years practicing ball games (football, basketball, handball, volleyball) in Cluj county (ball group – Sg), and children with no regular sports activities (control group - Cg) of the same age (5-12).

c) *Tests applied*

Because the age of the children ranged between 5 and 12 years, the parent or guardian of the child filled in the questionnaire and provided an informed consent on behalf of the child. The questionnaire and documents about the informed consent were distributed to 1273 families with children practicing basketball and to 1273 families with children that were not involved in regular sports activities (control group). The respondents were 1219 basketball players and 1001 control subjects. Children practicing multiple sports ($n=59$) were excluded from this study. The questionnaires with missing data ($n=79$ for ball players and $n=118$ for the control group) were also excluded. The final population comprised in this study included 1081 children for the sports group and 883 for the control group.

Our self-designed questionnaire contained the following questions: Age? Gender? Have you suffered injuries (in Cg and Sg)? What is your school level? What is your team level (Sg)? What is your playing experience (in years)? How many days of practice do you have per week (Sg)? How many breaks do you have during a practice? How many sleeping hours do you have during the week? If injured, in which body part (Sg and Cg)? What kind of head injuries did you suffer (Cg, Sg)? Did you wear any protection gear (Sg)?

The questionnaire excluded some data in the case of the control group (for example: years of practice/experience, team level (local/ district competitions), number of practice days per week (under 3/ over 3), time for rest (breaks) during practice (sufficient/insufficient), number of sleep hours/24 h (over 5, between 5-8, 8.5-9, over 9), types of injuries in the upper limbs/lower limbs/dento-facial injuries, types of dento-facial injuries: fractures of the upper or lower jaw/ soft tissue/ tooth injuries.

d) *Statistical processing*

The collected data were systematized in Microsoft Excel tables and employed for descriptive univariate statistical procedures.

**Results**

A number of 814 boys and 267 girls took part in the study in the sports group (1081 boys and girls). Gender distribution in the control group was: 392 boys (44.3%) and 491 (55.60%) girls (Fig. 1, Fig. 2).

**Fig. 1** – Gender distribution in the sports group.

**Fig. 2** – Gender distribution in the control group.

Age distribution for the sports group was as follows: 5-6 years, 396; 7-8 years, 311; 9-10 years, 255; 11-12 years, 119. Age distribution for the control group was the following: 211 (25%) children aged 5-6 years, 263 (31%) children aged 7-8 years, 196 (30%) children aged 9-10 years and finally, 113 children (14%) aged 11-12 years (Fig. 3, Fig. 4).

**Fig. 3** – Age distribution in the sports group.

**Fig. 4** – Age distribution in the control group.
In the sports group, out of 814 boys, 697 (85.62%) were uninjured and 117 (14.38%) had various injuries. In the control group, the rate of injuries was 9.62% (n=85 out of 883) (Fig. 5, Fig. 6).

Fig. 5 – Injured - uninjured rate in the sports group and in the control group.

In the sports group, out of 267 girls, 219 (82.02%) were uninjured and 48 (17.98%) had injuries. The distribution of injuries related to gender in the control group was >23 girls (27.06%) and 62 boys (72.94%).

Out of 1081 children in the sports group, 937 (86.67%) were in elementary school and 144 (13.33%) were in secondary school. The distribution of the control group was 368 (41.67%) in secondary school and 515 in elementary school (58.32%) (Fig. 7).

Fig. 7 – School level distribution in Sg and Cg.

Regarding the team level, a 14.1% injury rate was encountered in children taking part in inter-regional competitions, while 83.9% of the injuries occurred in local trainings/competitions (Fig. 8).

Fig. 8 – Distribution in the sports group related to the team level.

The experience of the players was also an important factor from our point of view. The children were divided into children with less than 1 year of practice, 1-5 years of practice and over 5 years of practice. Injuries occurred for the first category in 12.7% of the cases, and 87.3% of the children from this category were uninjured. In the 1-5 year experience category, 85.1% were uninjured, while 14.9% had injuries (Fig. 9).

Out of the children involved in sports for over 5 years, 84.7% were uninjured, while 15.3% had injuries (Fig. 9).

Fig. 9 – Distribution of injured / uninjured children related to the playing experience in Sg.

Another important factor was the number of practice days. Out of the 1081 children in the sports group, 165 had injuries. In 6.84% of the cases (74 children), injuries occurred in children with less than 3 days of practice per week and in 8.4% of the cases (91 children), in those with more than 3 days of practice per week (Fig. 10).

Fig. 10 – Distribution of injured/uninjured children related to the number of practice days of the players in Sg.
The time for breaks was also considered and was related to the occurrence of potential injuries. An assessment was made, and positive or negative answers (yes/no) were possible. The results showed a proportion of 50.89% (n=85) of cases with injuries that occurred when there was no sufficient resting time and a 49.11% (n=82) incidence when there was sufficient time for resting during the practice (Fig. 11).

![Fig. 11 – Assessment of break time during training in Sg.](image)

The degree of rest is another factor that can determine injuries, so we assessed the sleep time per day in number of hours. We found out that for the sports group, injuries occurred in 60.60% (n=100) of the cases in children with less than 6-7 sleep hours, in 33.93% (n=56) of the cases in children sleeping between 7-8 hours, and in 5.45% (n=9) of the cases in children with 8-9 hours of sleep. For the control group, the prevalence was 55.4% (n=49) for children who usually slept less than 6-7 hours per day, 28.3% (n=25) for those who slept 7-8 hours, and 12.45 (n=11) for those who usually slept 8-9 hours per day (Fig. 12).

![Fig. 12 – Distribution of injuries related to sleep hours in Sg.](image)

In the sports group, where 165 children were injured, 58 had upper limb injuries, 77 had lower limb injuries, and 30 had head injuries. In the control group, 52 children had upper limb injuries, 22 had lower limb injuries and 11 had head injuries (Fig. 13).

![Fig. 13 – Distribution of injuries in the ball group vs the control group.](image)

We divided the head injuries for both groups into the following categories: lower /upper jaw fractures and skull injuries, tooth injuries and soft tissue injuries, and we found out that there were 2 cases of fractures and skull injuries, 7 cases of tooth injuries and 21 cases of soft tissue injuries. In the control group, most injuries were fractures of the lower limbs, 25.88% (22 children), 60% (52 children) had upper limb fractures, and the rest of 14.11% (11 children) had head injuries (Fig. 13). Head injuries were divided as follows: 8 soft tissue injuries, 2 tooth injuries and 1 jaw and skull injury (Fig. 14).

![Fig. 14 – Distribution of head injuries in the ball group and the control group.](image)

In the sports group, with respect to wearing the protection gear, knee- and arm-rests for the lower/upper limbs and mouth guards for the dento-facial area, it was found that out of the 58 children with hand injuries, 42 did not wear arm-rests. Out of the 77 leg injuries, children did not wear knee protections only in 12 cases (65 had knee protections) and out of the 30 cases with head injuries, only 2 wore mouth guards, as a protection for soft tissues and teeth (Fig. 15).

![Fig. 15 – Distribution of injuries in Sg related to association or lack of association with protection gears (knee, elbow protection, mouth guards).](image)

**Discussions**

The incidence of injuries (injuries per 1000 playing hours) in adolescents’ ball games is encountered mainly during games, but injuries also occur during practice (Yde
Factors involved in the occurrence of body and head injuries

& Nielsen, 1990). Yde and Nielsen found the following distribution of injuries in various sports (Table I):

Table I

<table>
<thead>
<tr>
<th>No of years</th>
<th>&lt;10</th>
<th>&lt;14</th>
<th>&lt;18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injured players out of 1000</td>
<td>Football</td>
<td>65</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>Handball</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Basketball</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>95</td>
<td>80</td>
<td>117</td>
</tr>
</tbody>
</table>

(Yde & Nielsen, 1990)

The mechanism of injuries is complex, through: falls, kicks from another player, kicks from the ball, collisions, and is encountered in different proportions depending on the type of ball game and the importance of the play (training or competitions) (Nielsen & Yde, 1989).

It has been found that if lower limb injuries are considered all together: ankle, knee and hip injuries, they give the highest percentage of injuries compared with other body parts (Azodo et al., 2011).

In ball players, the most common injuries are: shoulder/arm, hand/finger/ thigh/leg, knee, ankle and foot injuries.

Contact sport athletes have up to 10% more probability of suffering orofacial injuries when compared to non-practitioners (Stephens et al., 1985) and a 33-56% risk of suffering a facial injury during their career. Contact sports have maintained a relevant place in causation of orofacial trauma because the face is the most vulnerable and least protected area of the body (Bemelmanns & Pfeiffer, 2000; Tulunoglu & Ozbek, 2006). Orofacial sports-related injuries are known to occur across a wide range of both organized and unorganized sports (Tesini & Soporowski, 2000). When screening 15 types of sports (Hootman et al., 2007), head-neck injuries reach a rate of 9.8-12.8% during practice and during games.

Studies also show that 13–39% (Sane, 1988) of all dental injuries are sports-related and of all sports accidents reported, 11-18% are maxillofacial injuries. Males are traumatized twice as often as females, with the maxillary central incisor being the most commonly injured tooth (Meadow et al., 1984). In children, sports activities were found to be responsible for 13% of overall oral trauma (Winters, 1996).

Conclusions

1. Within the limits of our study, we can state that the results are similar to those of similar literature studies regarding gender distribution and injury distribution related to the body parts.

2. We found out that the injury rate increased with age and experience in the basketball group, where the lower limbs, followed by the upper limbs and the head were the most injured parts of the body. Insufficient knee and elbow protections were worn, which were however found in a higher proportion of cases than mouth guards.

3. The authors suggest the need for further studies, in various population and age groups, in order to generate reference data for the general population.

Conflicts of interest

Nothing to declare.

Acknowledgement

All four authors have equal contributions to this study.

References


Influence of *Lepidium meyenii* on stress induced by walking on a treadmill

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Abstract

**Background.** High intensity physical exertion is a stress for the body; *Lepidium meyenii* (LM) is known for its antistress effects.

**Aims.** This study aimed to highlight phytotherapic modulation, under the action of a *Lepidium meyenii* product (LM; LMP), on anxiety (A), glycemia (G) and salivary pH (SpH), in physical stress caused by walking very fast on the treadmill, in sedentary subjects.

**Methods.** 24 healthy male volunteers were randomized to: a control group (C=8), without treatment; a group who received LMP 12 days (LM1=8); a group who received LMP 21 days (LM2=8). Stress model: walking very fast on the treadmill. Analyzed indicators: anxiety (A), glycemia (G) and salivary pH (SpH), in physical stress caused by walking very fast on the treadmill, in sedentary subjects.

**Methods.** 24 healthy male volunteers were randomized to: a control group (C=8), without treatment; a group who received LMP 12 days (LM1=8); a group who received LMP 21 days (LM2=8). Stress model: walking very fast on the treadmill. Analyzed indicators: anxiety (A), glycemia (G) and salivary pH (SpH). Determinations: before LM treatment (T1), 15 minutes (T2) before, 30 minutes (T3) and 4 hours (T4) after the physical effort. The results obtained were analyzed using the SPSS statistical package.

**Results.** For C, compared to T1, the most significant were: increases for A (T2), G (T3); decrease for SpH (T3). In LM1 and LM2, values were significantly: low for A (T2), G (T3); high for SpH (T3). LM2 impact was greater than LM1. LM1/ LM2 influence was more important on A.

**Conclusions.** 1) Dynamic developments of A, G, SpH were different for C, LM1/ LM2. 2) LM significantly reduced A/ G, increased SpH, with a more important influence on A. 3) LM2 effect was more intense than LM1. 4) We suggest LM may be useful in A, G, SpH modulation, in stress caused by walking very fast on the treadmill, in sedentary people, but further research is needed.

**Keywords:** stress, *Lepidium meyenii*, exercise, stress, anxiety, glycemia, salivary pH.

Introduction

Short-term physical exertion can be an important stress factor, as evidenced by increased cortisol (Cosio-Lima, 2012) and state anxiety, immediately pre- and post- exertion (Hermann et al., 2019; Jurcău & Jurcău, 2018), or involves other psychological factors (Monea et al., 2011; Ormenișan, 2008a; Ormenișan, 2008b). In addition, intense physical exertion can induce increased blood sugar (Jurcău et al., 2017; Keselman et al., 2017). On the other hand, modulation of the stress induced by physical exertion, especially by intense effort, has been a continuous concern for research in the field of sport, plant extracts and nutritional supplements. Thus, adaptogens (Panossian et al., 2018) and plants with an adaptogenic role represent an important resource for modulating stress in general and physical exertion stress, in particular. In this sense, there are studies that have shown the modulation of physical stress with *Eleutherococcus senticosus* (Kimura & Sumiyoshi, 2004), *Rhodiola rosea* (Huang et al., 2009), *Schisandra chinensis* (Panossian, 2013; Jurcău et al., 2019) and Ginseng (Yang et al., 2018; Jurcău et al., 2018).

*Lepidium meyenii* (LM or Maca) is a plant recognized for its adaptogenic qualities. The interest in LM has increased in many parts of the world, and since 2005 this has been considered one of the seven representative Peruvian products (Gonzales et al., 2009). LM is a plant that grows at over 4000 meters altitude in the Central Andes of Peru and has different varieties depending on the color of the hypocotyl (Gonzales et al., 2014). It was found that
differences between the biological properties of the three types of LM depend on differences in the cultivation soil (Zhao et al., 2012); on the other hand, all these varieties are present in the same soil (Tello et al., 1992). Thus, red maca has beneficial effects on mood, energy; black maca reduces blood sugar levels; both varieties produce similar responses on mood and health related quality of life score and improve quality of life parameters (Gonzales-Arimborgo et al., 2016). Maca contains many proteins, amino acids, fats and vitamins (Dini et al., 1994), secondary metabolites and other components (Cui et al., 2003).

LM is known to be an extremely effective remedy for the treatment of impotence (Qureshi et al., 2017) and a natural stimulant for improving sexual dysfunctions (Stone et al., 2009) in postmenopausal women, independent of estrogen and androgen activity (Brooks et al., 2008). It can also be used, as a dietary supplement, in the prevention and treatment of atherogenic lipoprotein, liver steatosis, antioxidative stress and impaired glucose tolerance (Vecera et al., 2007). Following treatment with black maca, in diabetic rats, thiorbarbituric acid reactive substances and carbonylated proteins were reduced; therefore, lipid oxidation was also diminished and also increased the activity of superoxide dismutase and antioxidants of catalase (Qiu et al., 2016). In vitro, Maca increased cell viability and reduced cytotoxicity against oxidative stress, suggesting a neurobiological effect (Rodriguez-Huamán et al., 2017). In cells pre-treated with Maca extract, SOD activity increased, so that LM exhibited an antioxidant effect, by inhibiting the activity of free radicals, thus having a neuroprotective effect (Masoudi et al., 2014).

Administration of Maca 1% in the diet of hypertriglyceridemic animals led to an improvement in lipid profile and an increase in glucose tolerance (Vecera et al., 2007). In another rat study, in which diabetes was induced by administration of streptozotocin, administration of yellow maca resulted in decreased blood sugar and insulin levels (Rodrigo et al., 2011). In a male rat experiment in which diabetes was induced by administration of streptozotocin, administration of a black maca hydroalcoholic extract reduced blood glucose by 50% (Gonzales et al., 2013).

LM is also consumed as a sports supplement by endurance athletes (Stone et al., 2009). Thus, macamides, the main active components contained in Maca, determine the alleviation of physical fatigue by alleviating lesions of skeletal muscle and myocardium during exercise (Zheng et al., 2019). Following administration of a soluble lipid extract of yellow LM for three weeks, physical resistance increased by 41% compared to the control value, and the administration of a hydroalcoholic extract of black maca led to an increase in physical resistance of over 500% compared to the control (Choi et al., 2012). The administration of maca extract for 14 days to cyclists, participants in a 40 km race, significantly and quickly improved the performance time (Stone et al., 2009). In another study, the administration of a fresh maca concentrate, 500 mg daily for 60 days, to ten professional football players led to an increase in oxygen consumption and physical resistance (Ronceros et al., 2005).

After higher doses of Maca treatment, in stressed mice, serum corticosterone levels were reduced (Ai et al., 2014). In addition, LM reduces psychological symptoms, including depression, anxiety (Brooks et al., 2008), and stress (Qureshi et al., 2017).

Objectives

This study aimed to highlight phytotherapeutic modulation, under the action of Lepidium meyenii (LM) product (LMP), on anxiety (A), glycemia (G) and salivary pH (SpH), in physical stress caused by walking very fast on the treadmill, in sedentary subjects.

Material and methods

Research protocol
a) Period and place of the research
An informed consent was obtained from each participant, according to the Declaration of Helsinki. The study was carried out in the 103 Family Medicine Cabinet in Cluj-Napoca, in December 2018.

b) Subjects and groups
A number of 24 volunteer healthy men were randomized to: the control group (C=8), without treatment; a group that received LMP for 12 days (LM1=8); a group receiving LMP for 21 days (LM2=8). The participants’ average age was: 29.1±3 (C), 30.2±3 (LM1), 31.4±4 (LM2). The volunteer subjects came from several fitness centers near the family medicine office, and at the family medicine office the work place was set up, under medical supervision. The treadmill was borrowed from one of these fitness centers. All participants were asked not to smoke, not to consume coffee, alcohol, and not to use any medication or antioxidant the day before and during the physical effort. The study did not include persons with mental disorders, toxic addiction and cortisone therapies.

c) Tests applied
1) Study design
Before physical testing, all participants had a 4-min muscle heating session, on the treadmill (Technogym Myrun) adjusted to 30 watts, and after a 10 min break, they followed the testing exercise session, on the same treadmill: starting with a power of 30 watts, for four minutes, followed by a gradual increase of power and continuing until the appearance of the feeling of fatigue, perceived by each subject.

The chosen phytotherapeutic preparation contains Lepidium meyenii (Maca) root powder (500 mg) (1). Lepidium meyenii product (LMP) was given for 12 (LM1) and 21 (LM2) days, respectively, in a dose of 3 tablets per day, at 8.00-14.00-20.00, prior to physical stress.

2) The indicator determination program was the same for C, LM1, LM2, being carried out as follows:
- time 1 = T1 - before LM treatment
- time 2 = T2 - 15 min before exercise
- time 3 = T3 - 30 min after exercise
- time 4 = T4 - 4 h after exercise

3) Explorations
The examinations consisted of measuring:
- anxiety (A) - evaluated with Beck Anxiety Inventory (2); this scale is a self-report measure of anxiety, with 21 items. Scoring: 0 = not at all; 1 = mildly, but it didn’t bother me much; 2 = moderately, it wasn’t pleasant at times; 3 = severely, it bothered me a lot. The total score is the sum
of the 21 items: 0-21 = low anxiety; 22-35 = moderate anxiety; ≥ 36 = concerning anxiety.

- glycemia (G) - evaluated with a portable glucometer (mg/dl).

- salivary pH (SpH) - evaluated with the PHS-3G laboratory acidity meter, following a protocol according to an already developed model (Baliga et al., 2013): saliva was collected in the morning, after a 10-hour fast, during which subjects could only drink water; the subjects were asked to thoroughly rinse their mouth with bottled drinking water, and after 5 minutes to spit the entire saliva into the collector tube by flowing naturally to the front of the mouth, once a minute, for up to 10 minutes; during collection, the subjects were asked not to cough, talk, or lower their heads; the amount of collected saliva was 5 ml.

d) Statistical processing

The results obtained were analyzed using SPSS 19.0 statistical package.

For continuous data examination, Student’s t test was used.

Results

We considered the parameter values for LM1 as a benchmark.

A. Anxiety (A) analysis (Table I)

For all groups, the dynamics of A was the same: the highest values were recorded immediately pre-stress (T2); the immediate post-stress values (T3) were close to immediate pre-stress values (T2); at 4 hours post-stress (T4), A values remained elevated compared to T1.

At T2, T3 and T4: the A values for C, compared to LM1 and LM2, were the highest; the values for LM2 were the lowest. C-LM1 differences were significant at T2 (p = 0.00001), T3 (p = 0.00001) and T4 (p = 0.00001). LM1-LM2 differences were significant at T2 (p = 0.00134), T3 (p = 0.00075) and T4 (p = 0.00197). T2-T3 differences were not significant for C (p = 0.06545) and significant for LM 1 (p = 0.0002) and LM2 (p = 0.00003).

B. Glycemia (G) analysis (Table II)

For all groups, G dynamics was the same: pre-treatment (T1) values were close to immediate pre-stress values (T2); the highest values were registered - immediately post-stress (T3); at 4 hours post-stress (T4), G values remained elevated compared to T1 and close to those at T3.

At T3 and T4: G values for C - compared to LM1 and LM2 - were the highest; G values for LM2 were the lowest. C-LM1 differences were significant at T2 (p = 0.00001), T3 (p = 0.00001) and T4 (p = 0.00001). LM1-LM2 differences were significant at T3 (p = 0.00888) and T4 (p = 0.39798). T3-T4 differences were: not significant for C (p = 0.05978) and significant for LM1 (p = 0.0193) and LM2 (p = 0.0004).

C. Salivary pH (SpH) analysis (Table III)

For all groups, SpH dynamics was the same: pre-treatment values (T1) were close to immediate pre-stress values (T2); the highest values were recorded immediately post-stress (T3); at 4 hours post-stress (T4), SpH values remained elevated compared to T1 and close to those at T3.
At T3 and T4: SpH values for C, compared to LM1 and LM2, were the highest; SpH values for LM2 were the lowest. C-LM1 differences were significant at T3 (p=0.00006) and T4 (p=0.00079). LM1-LM2 differences were significant at T3 (p=0.00498) and T4 (p=0.00016). T3-T4 differences were not significant for C (p=0.1039) and significant for LM1 (p=0.00059) and LM2 (p=0.00066).

D. Intergroup analysis, related to T2/T1, T2/T3, T2/T4

a) Anxiety (Fig. 1). For all groups: the greatest differences between ratios were for T2/T1, and the smallest ones were for T2/T4. The T2/T1 ratio was the highest for C (15.7), and the lowest for LM2 (8.73). The T2/T4 and T2/T4 ratios were the lowest for C (1.03, and 1.23 respectively) and the highest for LM2 (1.59 and 4.9 respectively).

Fig. 1 – Intergroup analysis, related to anxiety, for: T2/T1, T2/ T3, T2/T4.

b) Glycemia (Fig. 2). The greatest differences between the ratios were for T3/T1 (C=2.09, LM2=1.74) and T3/T2 (C=2.09, LM1=1.9), and the smallest ones were for T3/T4. The T3/T1 and T3/T2 ratios were highest for C (both 2.09) and the lowest for LM2 (1.74 and 1.69 respectively). The T3/T4 ratio was the lowest for C (1.02), and the highest for LM2 (1.09).

Fig. 2 – Intergroup analysis, related to glycemia, for: T3/T1, T3/ T2, T3/T4.

c) Salivary pH (Fig. 3). The greatest differences between the ratios were for T3/T1, and the smallest ones were for T3/T4 (C=1.02; LM1=1.05). The T3/T1 and T3/T2 ratios were the highest for C (1.15 and 1.14 respectively) and the lowest for LM2 (1.07 for both). The T3/T4 ratio was the lowest for C (1.02), and the highest for LM2 (1.09).

Fig. 3 – Intergroup analysis, related to salivary pH, for: T3/T1, T3/T2, T3/T4.

Discussion

1) Analysis of the results of the present study

The evolution of A, for all groups, had the highest increase in T2 values, which proves an anticipatory effect of stress, immediately prior to its production. The evolution of G and SpH, for all groups, had the highest increases in values at T3, which proves an important effect of stress immediately after its production.

The effect of physical stress on all parameters was the most intense for C. For A, the highest values being at T2 and T3, we compared the T2-T3 differences: it was found that the A values diminished immediately post-stress in LM2 (p=0.000034), compared to C (p=0.0002) and LM1 (p=0.06545). For G and SpH, the highest values being at T3 and T4, we compared the T3-T4 differences: G and SpH were found to be the lowest in LM2 at 4 hours post-stress (G, p=0.000034; SpH, p=0.00066), compared to C (G, p=0.0002; SpH, p=0.00059) and LM1 (G, p=0.06545; SpH, p=0.1039).

From the perspective of time ratios, it was found that the lowest effect of stress was on LM2. Parameter values increased the least, compared to T1: at T2, for A (T2/T1=8.73); at T3, for G (T3/T1=1.74) and SpH (T3/ T1=1.07). Parameter values decreased the most, compared to T2: at T3, for A (T2/T3=1.59); at T4, for A (T2/T4=4.9), G (T3/T4=1.09) and SpH (T3/T4=3.109).

Therefore, PML provided a good anti-stress protection, the effect being much more important after 21 days (LM2) than after 12 days (LM1), the evidence being the significant LM1-LM2 differences at T2 (A, p=0.00134), at T3 (A, p=0.000075, G, p=0.00888, SpH, p=0.00498) and T4 (A, p=0.00197; G, p=0.00959; SpH, p=0.00016).

2) Lepidium. Pubmed chronological evidence

a) Lepidium - History and framing

Of the varied flora of the Andes (Flores et al., 2003) - also part of Lepidium meyenii (maca) - a cruciferous plant of different colors (Gonzales et al., 2009), of the genus Lepidium (Meissner et al., 2015), the only one in the world that grows natively at an altitude of 4,000-4,400 m (Tello et al., 1992).
b) Lepidium - Stress

Lepidium is known and used as an adaptogen (López-Fando et al., 2004) and as an antioxidant (Zha et al., 2014). Lepidium has a high content of polysaccharides (Zha et al., 2014). Animal studies have shown Lepidium efficiency by: protecting the alteration of spermatogenesis due to altitude stress (Gonzales et al., 2004); inhibition of lipid peroxidation (Gonzales-Castañeda et al., 2011); the antidepressant effect (Ai et al., 2014); protection against physical fatigue (Choi et al., 2012); reduction of oxidative stress, evidenced by decreased malondialdehyde (Yang et al., 2016); reduction of lactic acid under conditions of intense physical exertion (Tang et al., 2017).

c) Lepidium - Anxiety

Due to its valuable composition of polysaccharides, Lepidium is effective in sports: it improves the capacity of resistance to swimming (Choi et al., 2012); reduces post-exercise fatigue (Yang et al., 2016; Li et al., 2018); increases the duration of physical effort in swimming and its speed of achievement (Tang et al., 2017); extends the exhaustive swimming time (Zheng et al., 2019).

d) Lepidium - Anxiety

Lepidium has been shown to be effective in modulating stress: it reduces corticosterone (López-Fando et al., 2004); reduces anxiety and depression (Brooks et al., 2008); modulates diastolic blood pressure (Stojanovska et al., 2015); and increases libido (Gonzales et al., 2009).

e) Lepidium - Glycemia

Lepidium has beneficial effects in modulating blood sugar: it reduces blood sugar in diabetic rats (Eddouks et al., 2005; Gonzales et al., 2013); increases glucose tolerance (Vecera et al., 2007); normalizes blood glucose and glycosuria (Eddouks & Maghrani, 2008); reduces glycemia after exposure to low and high altitude (Gonzales-Arimborgo et al., 2016); after exposure to methanol, it normalizes blood sugar, improves lipid levels and reduces oxidative stress (Attia et al., 2019).

The results obtained in our study on anxiety and glycemia, by using a Lepidium meyenii product, are consistent with data from recent studies related to the changes of these parameters, under the action of stress, sport and Lepidium species. This study also confirms the modulating effect of Lepidium meyenii on anxiety and glycemia. The difference from the quoted studies is that our study has shown the effectiveness of Lepidium meyenii administration not only on anxiety and glycemia, but also on salivary pH, in physical stress caused by walking very fast on the treadmill, in sedentary people, but further research is needed.

Conclusions

1. Dynamic developments of A, G, SpH were different for C, LM1/ LM2.

2. LM significantly reduced A/G, increased SpH, with a more important influence on A.

3. LM2 effect was more intense compared to LM1.

4. We suggest that LM may be useful in A, G, SpH modulation, in stress caused by walking very fast on the treadmill, in sedentary people, but further research is needed.

Conflicts of interest

Nothing to declare.

Acknowledgement

We would like to thank Doctor Alexandrina Fărăgău, for kindly hosting this study in the medical practice she runs.

References


Influence of Lepidium meyenii on stress


Websites
An opinion survey of doctors who attended a postgraduate course regarding spices and their use in sports

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Abstract

Background. Spices (SPS) have proved to be useful also in sports. The objective was to evaluate medical doctors’ (MD) opinion before/after a postgraduate medical course (PGC) about SPS and their use in sport (SPS-S).

Aim. It was to evaluate medical doctors’ (MD) opinion before/after a postgraduate medical course (PGC) about spices (SPS) and SPS in sport (SPS-S).

Methods. A number comprising 94-MD answered a detailed questionnaire: 1) What are SPS? 2) How many SPS-PGC did you attend? 3) Which are the native SPS-countries? 4) How many SPS types do you know? 5) What are the main SPS effects/mechanisms? 6) What are the age groups to which SPS can be administered? 7) Which SPS modulate oxidative stress? 8) Which SPS influence endurance? 9) Which SPS are useful in physical fatigue? 10) Which SPS are useful in muscle soreness? 11) Which SPS are useful in exercise performance? 12) Which SPS are useful in sports? 13) On a scale of 1-10 how much did this course help you know more about SPS/SPS-S? For data analysis we used the percentage of the total number of participants (% of N) who responded to each subitem.

Results. Most MD responses: 1) SPS are plants; 2) None; 3) Asian countries; 4) Four; 5) Increased immunity, antioxidant; 6) All less children; 7) Ginger, Cardamom, Curcumin; 8) I don’t know; 9) Ginger; 10) I don’t know; 11) Ginger; 12) Ginger; 13) 9.3.

Conclusions. 1) This PGC seems to be the first one regarding SPS. 2) Initially, most MDs had little SPS knowledge regarding SPS/SPS-S. 3) At the end of PGC, MDs demonstrated good accumulation of SPS information. 4) This PGC reached the goal of providing basic information about SPS/SPS-S, but additional SPS-related training is needed.

Keywords: spices, spices course, medical doctors, spices in sport.

Introduction

The concept of returning to the “roots” of medicine has been revived at present (Salehi et al., 2019). In human history and nutrition, spices have played an important role in the development of most cultures worldwide; they are part of substances added to foods, useful to enhance their aroma and taste (García-Casal et al., 2016). In cooking, different parts of plants, commonly referred to as herbs or spices, can be used: leaves, roots, bark, fruits, buds, seeds; spices have been used in gastronomic history to enhance the taste of food, being used, for example, for meat preparations, for sauces, vegetables and desserts (Opara & Chohan, 2014) or for drinks, to enhance their aroma and color (Yashin et al., 2017).

Over time, condiments have shown many benefits in preventing and treating a wide variety of ailments, such as aging, metabolic, neurological, cardiovascular and inflammatory diseases (Gottardiet al., 2016). These benefits are due to their multiple actions, such as antioxidant, anti-inflammatory, reducing glucose and cholesterol, improving cognition and mood (Jiang, 2019). Thus, in order to prevent and control many chronic diseases associated with malnutrition, in addition to caloric control and exercise, a spicy diet could also be considered (Nilius & Appendino, 2013). Underlying the actions of spices is the composition rich in different compounds, including polyphenols, which are increasingly studied, proving that they have a number...
It has been proven that herbs and spices have an excellent antioxidant activity. They are rich sources of antioxidants, thus being useful for treating oxidative stress-induced diseases (Yashin et al., 2017). Thus, spices have an effect on lipid peroxidation, by eliminating reactive oxygen species or by chelating the metal ions required to initiate lipid peroxidation (Shobana & Naidu, 2000). It has been found that synergism exists between the different phytochemical components of spices, as spices as a whole are more potent antioxidants than their purified active extracts (Patra et al., 2016).

Oxidative stress is correlated with muscle fatigue (Li et al., 2017). Thus, physical exercise results in an increase in the production of radicals and other forms of reactive oxygen species (ROS), which are the basis of oxidative disorders; these redox disorders induced by exercise in skeletal muscles contribute to the production of muscle fatigue and muscle injury (Powers & Lennon, 1999). Sport is an area that interferes more and more with that of plant extracts and various plant products, given their multiple health benefits. Thus, the antioxidative actions of some plants and plant-derived compounds on physical exertion are already demonstrated (Avakian et al., 1984; Abidov et al., 2003; Huang et al., 2009; Jóźwko et al., 2011; Jurcău & Jurcău, 2017). Also, different plant extracts have been shown to have beneficial effects in increasing endurance (Murase et al., 2006; Lee et al., 2009; Panossian, 2013; Jurcău & Jurcău, 2018) and performance (Yang et al., 2018; Jurcău et al., 2019) and reduce physical fatigue (Kimura & Sumiyoshi, 2004; Khanum et al., 2005; Yang et al., 2018; Jurcău et al., 2019).

Objectives

The aim was to evaluate medical doctors’ (MD) opinion before/after a postgraduate medical course (PGC) about spices (SPS) and SPS in sport (SPS-S).

Material and methods

Research protocol

a) Period and place of the research

The study and measurements were carried out in July 2018 at the “Iuliu Hațieganu” University of Medicine and Pharmacy. Participation of all subjects in the study was voluntary. The article capitalizes the results of a postgraduate course approved by the College of Physicians and held in 2018.

b) Subjects

The subjects were MDs of different specialties: 44 men and 50 women (N = 94). The average age of the participants was: 42.4 ± 9 for men; 49.9 ± 4 for women. All MD participants attended the same postgraduate course, on the topic of spices in sports.

c) Tests applied

- Study design

All MD subjects answered a detailed questionnaire, developed by Jurcău RN and Jurcău IM for the evaluation of this course, which contained 13 items, with their subitems (Table I).

- The determination program was as follows:

The participants answered the first 12 items 15 minutes before the course, and the last item, 13, 15 minutes after the end of the course.

d) Evaluation

For data analysis we used the percentage of the total number of participants (% of N) who responded to each subitem.

<table>
<thead>
<tr>
<th>Items</th>
<th>Subitems</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) What are SPS?</td>
<td>I do not know</td>
</tr>
<tr>
<td>2) How many SPS-PGC did you attend?</td>
<td>1</td>
</tr>
<tr>
<td>3) Which are the native SPS-countries?</td>
<td>I don’t know</td>
</tr>
<tr>
<td>4) How many SPS types do you know?</td>
<td>&lt;4</td>
</tr>
<tr>
<td>5) What are the main SPS effects/mechanisms?</td>
<td>I don’t know</td>
</tr>
<tr>
<td>6) What are the age groups to which SPS can be administered?</td>
<td>I don’t know</td>
</tr>
<tr>
<td>7) Which SPS modulate oxidative stress?</td>
<td>I don’t know</td>
</tr>
<tr>
<td>8) Which SPS influence endurance?</td>
<td>I don’t know</td>
</tr>
<tr>
<td>9) Which SPS are useful in physical fatigue?</td>
<td>I don’t know</td>
</tr>
<tr>
<td>10) Which SPS are useful in muscle soreness?</td>
<td>I don’t know</td>
</tr>
<tr>
<td>11) Which SPS are useful in exercise performance?</td>
<td>I don’t know</td>
</tr>
<tr>
<td>12) Which SPS are useful in sports?</td>
<td>I don’t know</td>
</tr>
<tr>
<td>13) On a scale of 1-10 how much did this course help you know more about SPS/ SPS-S?</td>
<td>1</td>
</tr>
</tbody>
</table>
Results

The presentation is in the order of the items in the questionnaire.

1) What are SPS? (Fig. 1) MD answers: 71.4% mentioned that SPS are plants; 3.1% answered that SPS are flavors; 20.6% mentioned that ADPs are extracts; 4.9% did not know.

![Fig. 1 – The percentage of respondents of N, for item 1.](image)

2) How many SPS courses did you attend? (Fig. 2) All participants (100%) mentioned that they had not attended another SPS course.

![Fig. 2 – The percentage of respondents of N, for item 2.](image)

3) What are the native SPS countries? (Fig. 3) The mentions for SPS countries were: 40% for India; 24% for countries of Arab origin; 19% for Mediterranean countries; 13% for yellow race countries (China, Japan, Korea); 4% for other countries; 0% did not know.

![Fig. 3 – The percentage of respondents of N, for item 3.](image)

4) How many SPS types do you know? (Fig. 4) The mentions for SPS types were: 49% for four types (pepper, cinnamon, cardamom, ginger); 30% more than four; 21% less than four.

![Fig. 4 – The percentage of respondents of N, for item 4.](image)

5) What are the main SPS effects/mechanisms? (Fig. 5) The mentions for SPS types were: 42.2% for increase in immunity; 31.4% for antioxidant effects; 19.3% for other effects; 7.1% did not know.

![Fig. 5 – The percentage of respondents of N, for item 5.](image)

6) What are the age groups to which SPS can be administered? (Fig. 6) The mentions for the age groups to which SPS can be administered were: 1.2% did not know; 3% for 0-18; 40.9% for 19-44; 31.9% for 45-64; 19% for 65-90; 4% for >90.

![Fig. 6 – The percentage of respondents of N, for item 6.](image)
7) Which SPS modulate oxidative stress? (Fig. 7)
The mentions for SPS that modulate oxidative stress were: 43.1% for curcumin; 20.4% for ginger; 10% for cardamom; 9.4% for other SPS; 17.2% did not know.

Fig. 7 – The percentage of respondents of N, for item 7.

8) Which SPS influence endurance? (Fig. 8) The mentions for SPS that influence endurance were: 72% did not know; 17% for other SPS; 4.9% for curcumin; 4.2% for ginger; 1.9% for cardamom.

Fig. 8 – The percentage of respondents of N, for item 8.

9) Which SPS are useful in physical fatigue? (Fig. 9) The mentions for SPS useful in physical fatigue were: 49% for ginger; 34% did not know; 17% for different SPS.

Fig. 9 – The percentage of respondents of N, for item 9.

10) Which SPS are useful in muscle soreness? (Fig. 10) The mentions for SPS useful in muscle soreness were: 90.1% did not know; 9.9% for different SPS.

Fig. 10 – The percentage of respondents of N, for item 10.

11) Which SPS are useful in exercise performance? (Fig. 11) The mentions for SPS useful in exercise performance were: 43.4% for ginger; 37.3% did not know; 19.3% for different SPS.

Fig. 11 – The percentage of respondents of N, for item 11.

12) Which SPS are useful in sports? (Fig. 12) The mentions for SPS useful in sports were: 40.3% for ginger; 39.3% did not know; 20.4% for different SPS.

Fig. 12 – The percentage of respondents of N, for item 12.
Spices - Concept

Spices have been used since ancient times, mainly as flavoring and coloring agents, but also for food preservation (Gottardi et al., 2016). In addition, spicy food not only provides an important hedonic contribution, but also has beneficial effects on our health, such as modulation of gastrointestinal and cardiovascular activities, skeletal muscle performance, reduction of chronic inflammation and prevention of metabolic syndrome and diabetes (Nilius & Appendino, 2013). There is a wide variety of forms in which condiments can be used: fresh, dried whole, or dried before grinding (Balasubramanian et al., 2016).

Spices - Effects / Mechanisms

It has been proven that spices have various beneficial effects on human health, including the following actions: anti-sclerotic, anti-inflammatory, anti-thrombotic, anti-rheumatic, anti-arrhythmic, gastroprotective, lipid lowering, lipoprotein oxidation inhibition with low density and protein glycolysis, anti-allergic, anti-malarial, anti-viral (Yashin et al., 2017) and anti-microbial (Liu et al., 2017).

Spices - Oxidative stress. Some examples of spices are used in oxidative stress.

Among the spices proven to have antioxidant potential are the following, for which their active components are mentioned: turmeric/curcumin, cloves/eugenol, red pepper/capsaicin, black pepper/piperine, ginger/gingerol, garlic/onion (Srinivasan, 2013). Types of spices with antioxidant effects: ginger - Zingiber officinale Rosc. (Zingiberaceae), by gingerol (Dugasani et al., 2010); rosemary, via carnosic acid, caffeic acid and its derivatives, such as rosmarinic acid (Moreno et al., 2014); other spices - cinnamon (Jayaprakasha et al., 2003), black pepper (Kapoor et al., 2009), curcumin (Abrahams et al., 2019).

Spices - sports, endurance, physical fatigue, muscular sensation, exercise performance.

A study in healthy male rats shows that regular training and supplementation with cinnamon bark extract increases overall antioxidant capacity and protects against oxidative damage induced by exhaustive exercises (Dehghan et al., 2014). Another experimental study in rats with diabetes, undergoing a resistance exercise, showed that the administration of rosemary extract can alleviate oxidative stress, by improving the activities of antioxidant enzymes and lowering the level of lipid peroxidation (Nazem et al., 2015). Curcumin can improve physical performance and prevent fatigue; thus, supplementation with curcumin results in increased endurance and physical performance and significantly reduces post-exercise lactate levels (Huang et al., 2015). Ginger can reduce pain through endurance and prolonged running; it can accelerate the recovery of maximal power after resistance exercise and reduce the inflammatory response to cardiorespiratory exercises (Wilson, 2015). Supplementation with capsaicin, a bioactive phytochemical substance in peppers, CAP, can lead to improved physical performance and alleviation of physical fatigue (Hsu et al., 2016). In the case of exercise-induced muscle injury, daily consumption of raw and heat-treated ginger leads to moderate to large reductions in muscle pain (Black et al., 2010). Coriander oil, used for massage as such or incorporated into creams or lotions, can help reduce mental tension and fatigue, as well as muscle spasms (Balasubramanian et al., 2016). Piperine, an active compound in black pepper, is a source for improving exercise capacity, as it balances carbohydrate and fat metabolism, as well as redox reactions during exercise (Kim et al., 2017).

Conclusions

1. This PGC seems to be the first one regarding SPS.
2. Initially, most medical doctors had little knowledge regarding spices/ spices in sport.
3. At the end of the postgraduate medical course,
medical doctors demonstrated a good accumulation of information about spices.
4. This postgraduate medical course reached the goal of providing basic information about spices/ spices in sport, but additional SPS-related training is needed.

Conflicts of interest
Nothing to declare.

Acknowledgement
The data regarding the course evaluated in this paper are the following: name “The modulatory role and the effects of spices in the mechanisms of stress”; code 112; period, 13.07.2018-17.07.2018. In order to have more participants, doctors enrolled in courses with the codes 113 and 114, courses which were conducted during the period 03.07.2018-07.07.2018 and 08.07.2018-2.07.2018, respectively, were also allowed to attend the course, to listen and to complete the questionnaire. All the three courses were organized within the Pathophysiology Department and were coordinated by Ramona-Niculina Jurcău and Carmen Sfangeu. The courses can be found in the 2017-2018 brochure of the “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca.

References


Increased serum interleukin 6 in experimental periapical periodontitis associated with metabolic bone disease

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Abstract

Background. Inflammatory cytokines such as interleukin 6 (IL-6) have implications in the pathogenesis of metabolic bone disorders and also in periapical disease. Both metabolic bone diseases and periapical periodontitis (PP) share a common feature represented by inflammation-mediated bone loss; however, the specific role of these cytokines is not always consistent.

Aims. The aim of the study was to assess the serum IL-6 levels and investigate the associations with histomorphometric changes in the alveolar bone around the molar roots in a rodent experimental model of PP.

Methods. The research was conducted on 3 groups of animals: group A – animals without any pathology, group B – animals with PP, and group C – animals with PP and simulated metabolic bone disease treated with alendronate (ALD). Peripheral blood was collected for biochemical analysis of IL-6 interleukin levels and the lower jaws were removed for histomorphometric analysis.

Results. Serum IL-6 levels were significantly increased in the experimental groups compared to the control group (p <0.05). In group B, a moderate inflammatory infiltrate and a medium number of osteoclasts were present, while in group C, discrete inflammatory infiltrates accompanied by a low number of osteoclasts were confirmed by histomorphometric analysis.

Conclusions. The induction of PP determines elevated circulating levels of IL-6 with repercussions on the systemic state, maintaining a low degree of inflammatory response. The administration of ALD in female rodents contributes to the diminishing rate of extension in PP, limiting the destruction of the tissues.

Keywords: interleukin 6, periapical periodontitis, bone metabolism, estrogen deficiency.

Introduction

Periapical periodontitis (PP) is characterized by an inflammatory response of the periodontium at the root apex of teeth and concurrent progressive alveolar bone destruction as a consequence of pathogenic bacteria persistence in the endodontic biofilms (Nikolic et al., 2019; Romualdo et al., 2018). The supporting tissues of the teeth including alveolar bone, periodontal ligament and cementum are all affected during the development stages of the periapical disease.

Under physiological conditions, the complex remodeling process that appears in bone is controlled by the balance between bone formation by osteoblasts and degradation by osteoclasts. The main factor responsible for this activity is the receptor activator for NF-κB ligand (RANKL)/osteoprotegerin (OPG) ratio, expressed by the bone cells (Blaschke et al., 2018; Al-Daghri et al., 2017). Osteoblasts are responsible for the construction of bone material by generating collagen, osteopontin and osteocalcin, and transforming them into an osteoid matrix. Then, the mineralization of the newly formed matrix is enhanced by calcium phosphate, hydroxyapatite and calcium carbonate. Osteoclasts manifest enzymatic activity contributing to the degradation of the bone matrix through resorption pits filled with acidic proteases (McDonald et al., 2017; Harmer et al., 2019).

Under pathological conditions, the bone cells release various inflammatory cytokines, such as interleukin 6 (IL-6) which plays a major role in the development of metabolic bone diseases (Hunter & Jones, 2015;
Schet et al., 2018; Eftekhar et al., 2018) and in the progression of periapical pathology (Balto et al., 2001; Azuma et al., 2014). IL-6 cytokine acts by reducing bone mineral density, affecting normal bone metabolism, and is assumed to have implications associated with osteoporosis (OP) (Yan et al., 2015; Kany et al., 2019; Saribal et al., 2019; Ding et al., 2008; Li et al., 2016) through different pathways: increasing osteoclast differentiation, activation, survival, enhancing RANKL expression and inhibiting osteoblast survival (Al-Daghriri et al., 2017; Harmer et al., 2019). The uncoupling of the mechanism behind bone formation and resorption may induce metabolic bone diseases, including OP. The reduction of estrogen levels due to the loss of ovarian function in postmenopausal women determines bone loss and OP (Harmer et al., 2019; Eftekhar et al., 2018). Experimental studies investigating the relationships between hypoestrogenic conditions induced by ovariectomy and bone changes showed a decrease in mineral bone density of jaws in rodents (Romualdo et al., 2018) and also, structural modifications in trabecular alveolar bone (Tanaka et al., 2003; Duarte et al., 2004).

Pharmacological agents including alendronate (ALD), neridronate, ibandronate and other similar compounds are the primary drugs currently used in the treatment of metabolic diseases (Raj et al., 2016). These drugs exert effects on osteoclast activity, inhibiting bone resorption by lowering osteoclast numbers and influencing the RANKL/OPG ratio, as well as on osteoblasts.

**Hypothesis**

This study aimed to assess the serological modifications of IL-6 levels and also, to investigate the associations between serum IL-6 values and histomorphometric changes in the alveolar bone around the molar teeth roots in an experimental model of PP.

**Material and methods**

Research protocol

a) Period and place of the research

The present study received the approval of the Ethics Committee of the “Iuliu Hatieganu” University of Medicine and Pharmacy Cluj-Napoca. The experimental protocol was in agreement with the ethical research principles regarding the handling of laboratory animals, and took place between January and June 2016 in the Experimental Laboratory of the Physiology Department of the “Iuliu Hatieganu” University of Medicine and Pharmacy Cluj-Napoca.

**b) Subjects and groups**

A total of thirty female rodents (Rattus norvegicus) with a mean age of 3 months and a weight ranging between 250 g and 280 g were obtained from the Centre of Experimental Medicine of our University.

The study groups (10 animals / group) comprised:

- group A - rodents without any pathology;
- group B and group C, in which occlusal cavities in the lower molar teeth with dental pulp chamber opening were created, using a round steel bur, carefully avoiding furcal perforations. Group C was also subjected to the surgical procedure of ovariectomy, according to the technique described by Khajuria et al., 2012, following which bone metabolism deficiencies were induced as a result of the reduction of estrogen levels. After 10 days postoperatively, alendronate sodium treatment was administered in group C by subcutaneous injection, in two weekly doses of 1 mg/kg body weight until the end of the experiment.

**c) Tests applied**

For evaluation at different moments of the experiment, peripheral venous blood was collected at 2, 4 and 8 weeks in test tubes, centrifuged at 4°C for 15 min and preserved at -20°C until biochemical analysis. The quantitative detection of IL-6 in serum samples was performed using Rat IL-6 ELISA kit (Boster Biological Technology Co., Ltd.), according to the manufacturer’s instructions.

At the moments mentioned above, the animals were sacrificed and their lower jaws were excised in order to perform histomorphometric investigations. The specimens were fixed by immersion in 10% buffered formalin for 24 h and preserved in 4% EDTA solution until complete decalcification. After paraffin embedding, the blocks containing the molar teeth were longitudinally sliced along their axis, resulting in 5 μm thick serial sections. They were stained with hematoxylin and eosin (HE) and subjected to light microscopy for evidencing the apical and periapical regions of the molar teeth. The inflammatory cellular infiltrate and the degree of bone loss were investigated histomorphometrically by quantification of the inflammatory cells and osteoclasts present in the perimeter of the analyzed regions.

**d) Statistical processing**

The data of this study were statistically analyzed using Starts Direct v 2.7.2 software and Excel (Microsoft Office 2010).

**Results**

The analysis of serum IL-6 levels considering the three groups of rodents at different experimental moments and their statistical significance were presented in Table I.

<table>
<thead>
<tr>
<th>Moments</th>
<th>Group</th>
<th>Mean ± SD</th>
<th>Statistical significance (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2w</td>
<td>A</td>
<td>2.82 ± 0.18</td>
<td>A-B 0.0020 2w-4w 0.0038</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>2.50 ± 0.23</td>
<td>A-C 8.14x10^-5 2w-8w 2.17x10^-4</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>5.70 ± 1.33</td>
<td>B-C 1.98x10^-5 4w-8w 8.97x10^-5</td>
</tr>
<tr>
<td>4w</td>
<td>A</td>
<td>2.82 ± 0.18</td>
<td>A-B 0.5639 2w-4w 0.002</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>2.95 ± 0.40</td>
<td>A-C 5.52 x 10^-12 2w-8w 0.1641</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>6.84 ± 0.44</td>
<td>B-C 6.29x10^-14 4w-8w 0.3482</td>
</tr>
<tr>
<td>8w</td>
<td>A</td>
<td>2.82 ± 0.17</td>
<td>A-B 3.21x10^-4 2w-4w 0.0309</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>4.02 ± 0.43</td>
<td>A-C 0.0020 2w-8w 0.8526</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>5.85 ± 2.22</td>
<td>B-C 0.0284 4w-8w 0.2364</td>
</tr>
</tbody>
</table>
The statistical analysis of IL-6 values evidenced the following for unpaired samples:

- at 2 weeks - highly statistically significant differences between groups A and C (p<0.001) and also between groups B and C (p<0.001);
- at 4 weeks - similar results to those obtained at 2 weeks;
- at 8 weeks - very statistically significant differences between groups A and C (p<0.01) and also between groups B and C (p<0.05).

The statistical analysis of IL-6 values showed the following for paired samples:

- in group B - highly statistically significant differences between weeks 2-8, weeks 4-8 (p<0.001) and very statistically significant differences between weeks 2-4 (p<0.01);
- in group C - statistically significant differences between weeks 2-4 (p<0.05).

Regarding the descriptive histological analysis of tooth sections, in group A, tooth sections showed no inflammation or bone resorption (Figs. 1A, C). Group B, at 2 weeks, showed PP in acute stages with a higher intensity, necrosis of periodontal ligament, resorption of mineralized tissues (bone and radicular cement) (Fig. 1B). At 4 weeks, there was a predominantly moderate inflammatory infiltration of mononuclear cells (macrophages, lymphocytes) and greater bone loss, and at 8 weeks, the intensity of PP decreased, chronic inflammatory cell infiltrate was present and bone destruction was stabilized. In group C, PP appeared at 2 weeks, with inflammatory infiltrate mainly consisting of neutrophils and macrophages. Also, reduced alveolar bone resorption was observed. Frequently encountered, dental pulp lesions were represented by septic pulp necrosis. In parallel, a conjunctive reaction was observed with the multiplication of fibrous tissue (Fig. 1D). At 4 weeks, the same lesions were present, specifically bone loss, pulp necrosis, desmodontal space widening and fibrous tissue multiplication, and at 8 weeks, PP changes were identical to those previously mentioned, but their intensity was more reduced.

The statistical analysis of inflammatory infiltrate evidenced the following for unpaired samples:

- at 2 weeks – very statistically significant differences between groups B and C (p<0.01);
- at 4 weeks – no statistically significant differences between the groups of rodents;
- at 8 weeks – highly statistically significant differences between groups B and C (p<0.001).

The statistical analysis of inflammatory infiltrate evidenced the following for paired samples:

- in group B – no statistically significant differences between the time moments (p>0.05);
- in group C – statistically significant differences between weeks 2-4 and weeks 4-8 (p<0.01).

The statistical analysis of alveolar bone resorption evidenced the following for unpaired samples:

- at 2 weeks – very statistically significant differences between groups B and C (p<0.01);
- at 4 weeks – highly statistically significant differences between groups B and C (p<0.001);
- at 8 weeks – statistically significant differences between groups B and C (p<0.01).

The statistical analysis of alveolar bone resorption evidenced the following for paired samples:

- in group B – no statistically significant differences between the time points (p>0.05); in group C - statistically significant differences between weeks 4-8 (p<0.01) and weeks 2-4 (p<0.05).

In group B, IL-6 levels were positively correlated with the number of osteoclasts, having the correlation coefficient r= 0.5522, and with the inflammatory infiltrate, r= 0.5618, at 2 weeks, and negatively correlated with the inflammatory infiltrate at 8 weeks, r= - 0.8528. In group C, IL-6 was negatively correlated with the number of osteoclasts, r= - 0.8381.

![Fig. 1 – A, C. Periodontal space and apical regions with normal aspect (arrows), H&E x 100; B. Cementum and bone resorption (thick arrow), osteoclasts (short arrows), H&E x100; D. Periodontal inflammatory infiltrate (thin arrows), epithelialization (thick arrows), H&E x 400.](image-url)
Discussions

Both PP and OP are pathological conditions affecting bone, with an imbalance in the turnover process. PP is a localized process reflected in alveolar bone (Azuma et al., 2013), whilst OP manifests as a metabolic dysregulation in the entire skeleton with the excessive activity of osteoclasts. In the case of PP, the locally accumulated inflammatory cells in the affected area generate the cytokine and inflammatory mediators, acting as causative factors in alveolar bone destruction, concomitantly with the hindering of the repair or formation of new bone. In the case of OP, a longer time period is needed for the emergence of structural modifications in cancellous bone and the involved mechanisms have a greater complexity (Mundy et al., 1993).

The available literature emphasizes the role of bone cells in maintaining bone homeostasis (Jeong & Kim, 2016; Schett, 2018; Metzger & Narayanan, 2019). The activity of these cells influences the equilibrium between bone formation and resorption. The major implication of osteoclasts in bone loss is well known: their activation following various pathological conditions determines an increased production of inflammatory cytokines, such as IL-6 (Kany et al., 2019; Eftekhariri et al., 2018). A recent study observed a high risk of bone resorption in postmenopausal women with OP as a consequence of estrogen deficiency and release of IL-6 cytokine activating osteoclasts through RANKL (Al-Daghri et al., 2017).

The current study revealed that serum IL-6 levels of ovariectomized rodents treated with ALD were increased in all stages when compared with control and PP groups. These results are in agreement with other studies reporting elevated concentrations of inflammatory cytokines in peripheral blood associated with PP (Zhang et al., 2015; Georgiou et al., 2019).  

PP and OP are characterized by bone loss coinciding with increased IL-6 secretion. In an endodontic context, IL-6 acts as an important mediator in modulating the response to bacterial infection (Nibali et al., 2012), being synthesized locally by bone cells (Balto et al., 2001), and reflected later in systemic peripheral blood (Georgiou et al., 2019). It is also known as a regulatory factor in the differentiation activity of osteoblasts and osteoclasts (Xie et al., 2018; Yan et al., 2015; Harmer et al., 2019). IL-6 overexpression may be linked to the extent of chronic inflammatory lesions, resulting in alveolar bone resorption and damage to the periodontal ligament (Nibali et al., 2012).

The pathological role of IL-6 as a mediator in bone resorption has been subjected to controversy over the last decades. Clinical and experimental studies investigating IL-6 expression report the release of this cytokine from osteoblasts (Xie et al., 2018; Yan et al., 2015), with a pivotal role in the formation of osteoclast precursors (Balto et al., 2001; Romualdo et al., 2018), leading to an increased number of osteoclasts and activating the bone resorption pathways (Ji et al., 2019; Harmer et al., 2019). Other studies addressing the impact of IL-6 in the pathogenesis of PP found high IL-6 levels correlated with the extent of tissue damage (Abdolsamadi et al., 2008). Cintra et al., 2016 found elevated serum levels of IL-6 in a rat model of apical periodontitis. Bresil et al., 2017 suggested that prolonged estrogen deficiency influences the progression of apical periodontitis, causing greater lesions in ovariectomized rats, due to the persistence of the inflammatory process in the bone. Inflammation-induced osteolysis proved to be present in both postmenopausal OP and periapical diseases, as a possible systemic damaging factor (Lopez et al., 2015; Romualdo et al., 2018). A recent study conducted on ovariectomized rodents with induced PP showed more elevated levels of proinflammatory cytokines, hypothesizing the role of estrogen activity in post-menarche women with apical disease (Romualdo et al., 2018). The property of bisphosphonates to bind the crystals of hydroxyapatite makes them useful in the treatment of certain pathologies associated with increased bone resorption, such as OP (Xiong et al., 2010).

According to the literature, little evidence concerning the impact of PP is available. Xiong et al., 2010 focused on the effects of bisphosphonate administration on alveolar bone resorption, using one of the most efficient agents, alendronate, in experimentally induced PP. Their study suggests the possible implication of alendronate in the inhibition of osteoclast activity. The reduction of bone damage in PP was observed in ovariectomized rats as a consequence of this therapy, suggesting the possible protective role of these agents (Wayama et al., 2015) in the inhibition of osteoclastogenesis. Our study subscribes to these previous findings regarding the effects of bisphosphonates on the development of PP.

Concerning the histological analysis of the periapical area in the present study, moderate inflammatory changes in animals with induced PP were detected when compared to reduced inflammatory changes in ovariectomized animals treated with alendronate. A moderate number of osteoclasts in direct contact with the alveolar bone surrounding the affected area in PP animals was observed when compared to the low number of osteoclasts in treated ovariectomized animals. Future studies are needed in order to elucidate the complex mechanisms involved in the pathogenesis of PP, with focus on the implications of cytokines in inflammatory alveolar bone alterations.

Conclusions

1. Elevated circulating IL-6 levels were identified in association with alveolar bone resorption in the experimental model of PP.

2. A negative correlation was observed between bone loss and IL-6 values in PP and simulated metabolic bone disease, probably due to the action of ALD in diminishing the rate of alveolar destruction.

Conflicts of interest

Nothing to declare.

Acknowledgements

The article exploits the data from the first author’s doctoral thesis, defended in 2016, at the Iuliu Hatieganu University of Cluj-Napoca.

References


Research regarding the development and evaluation of agility (balance, coordination and speed) in children aged 9-10 years

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Abstract

Background. Physical education in school is a crucial activity in establishing a well-balanced and harmonious body from young children to teenagers, developing motor skills, personality traits and building strong and durable relationships. One of the most important motor skills developed in physical education, in school, is the combination of speed, coordination and balance named nowadays agility. More authors described agility as being the capacity to quickly change direction, having high levels of speed and coordination, being well-balanced and creative.

Aims. The present study followed the idea of finding and evaluating the level of agility development in primary school children aged between 9 and 10 years old. The research group was composed of children from two Romanian schools: School “Mihai Eminescu” and School “George Popa” from Medias — Sibiu, with a sample of 105 children (49 males and 56 females) aged between nine and ten years old. The program of improvement was implemented 15 minutes in every physical education class for a 3-month period in 2019.

Methods. The research method used was an experimental method using two agility tests (the Agility T test and the Agility L test) whose purpose was to evaluate the initial and final level of agility. For statistical interpretation, the t-Student test, Mann-Whitney test and Welch correlation were used.

Results. The results in both agility tests showed improved results from the initial test to the final test after the 3-month training period. A statistically significant difference was found comparing the initial and final results of the male subjects in both schools in agility T test and also in agility L test. In addition, a statistically significant difference was demonstrated between the initial and final evaluation in female subjects by agility L test and by comparing the initial and final results of females between schools using the agility T test.

Conclusions. The conclusions of our experiment showed that the hypothesis was confirmed that following implementation of a specific program of development of combined motor qualities, speed and coordination (agility) can be improved and significantly better results in the two applied tests, between the initial and the final testing, can be obtained. Developing agility at young ages can contribute to a future athlete’s sport career by building a strong foundation of motor skills.

Keywords: agility, speed, coordination, dynamic balance, body movement.

Introduction

Depending on the area to which we refer, the term movement may have different meanings. In the field of physical exercise practice, movement represents “the ability of an individual to travel from point to point, with the purpose of changing the position of the body or the different body segments, to move, to interact with other individuals and to act in the environment (physical or social)”. Depending on its nature, movements can be voluntary, non-voluntary, cyclic, acyclic, automatic, passive, active, uniform, accelerated, etc. All these represent types or genres of movement (Hantiu, 2013a).

Motor qualities or skills are defined by some authors as those characteristics of the body that materialize in the body’s ability to perform movements with certain speed, strength, coordination or resistance indices. They are present in all the motor acts of individuals, each of them requiring a certain degree of manifestation of the others (Hantiu, 2013b).

Neagu (2012) asserted that although aptitudes largely belong to the genetic portfolio of an individual, they have in their composition a series of phenotypic elements (under the influence of the educational environment, for example), participating in their translation (through
developing processes) from predisposing primary forms to increasingly refined, superior forms, defined in the form of talent, skill, etc.

In another form, motor skills can be defined as those predominantly endogenous individual characteristics—hereditary predispositions—with a share of exogenous influences—of an instructive-educational nature, which determine external motor manifestations, the actual movements, respectively (Neagu, 2012).

Motor qualities are considered important for the physical, mental and social evolution of children (Gallahue & Ozmun, 2002) and may even be the foundation of an active and healthy lifestyle, as many studies have shown a positive association between good motor skills and higher levels of physical activity. For example, it has been shown that a good index of the level of motor qualities has positive effects on health, effectively influencing the improvement of the cardiorespiratory capacity, the maintenance of an optimal body weight, the improvement of the level of practice and daily activities, the development of the executive function of the body, etc. (Lubans et al., 2010; Fisher et al., 2005; Williams et al., 2008; Krombholz, 2013).

The musculoskeletal and postural aesthetic deficiencies of human beings are in full ascension due to the new modern lifestyle and lack of concern for the prevention of their appearance, thus resulting in pronounced somatic disabilities (Vos et al., 2010). Research conducted in the last decade shows that biomechanical disorders start at an early age, and that problems emerging during this period can be present throughout life. Thus, a child who has physical pain during this period of development may experience pain even in adulthood (Hestbaek et al., 2006). It is very important to point out that these musculoskeletal disorders can have serious consequences on the physical and mental development of the child. A child with physical deficiencies will have a more withdrawn behavior, will be tempted to give up social activities that may have benefits on different levels and will present a major risk of behavioral underdevelopment. Last but not least, that child will be tempted to give up physical and sports activities, which play a very important role in maintaining health, thus being prone to other physiological problems, such as cardiovascular problems, diabetes, etc. (Andersen et al., 2016).

Several scientific sports studies concluded that one of the most important elements of the agility skill is speed or the rapid movement of the body. Older definitions of the agility skill are considered by many too basic and simplistic; the basic or the basic elements of the agility skill are more likely to be: balance of the body, coordination of parts of the body or the entire body, also the ability or the possibility of athletes to adapt and have rapid reactions to a change of the environment or different situations (Plisk, 2008). More and more specialists consider nowadays that the agility technique is a more complex motor skill and consider agility among the mixed physical motor skills composed of a combination of basic motor skills (Mekota, 2000). Although speed is a fundamental component of the agility skill, scientists affirm that it must not be confused or misinterpreted, and one must not put an equal sign between speed and agility; agility has more components and can be superior to speed or quickness; this combined ability also has coordination and balance abilities.

The newer investigation in sports research concluded that speed ability and agility motor quality represent independent and different physical motor abilities and in the process of their development they require a high level of muscular specificity development (Sheppard & Young, 2006). Particular attention should be given to the development of the agility skill, to the anticipation and decision-making abilities (Young et al., 2002). Also, the speed and agility techniques involve moving the whole body very quickly, but unlike the speed skill, the attribute of changing direction is added to the agility skill.

A general definition of agility that is accepted by many sports scientists presents the agility skill as “a rapid whole-body movement with modification of running direction in response to a stimulus” (Van Gelder & Bartz, 2011). The agility skill implies the movement of the entire body or only of the upper or lower body segments to rapidly change the running direction without losing precision or balance (Allum et al., 2002).

The fundamental components of the agility skill are coordination and movement control, but they must be taken into account apart from the other components that affect the level of agility development, such as dynamic balance, mobility of joints, power of the body, and flexibility or elasticity, levels of energy resources, strength, speed and biomechanical structure of movement (Sporis et al., 2010).

Objectives

This research was aimed at examining several important phenomena, which must be studied in the field of physical education and sport. Some of the most important tasks of the research are the importance of educating and developing motor qualities in children, the motor skills examined in this study being speed and coordination, tested and interpreted in a combined and unitary way, through a series of motor activities corresponding to their studies.

Hypothesis

In the present research, we started from the hypothesis that tracking the application of our specific program of development of the combined motor qualities, speed and coordination (agility), we will obtain significantly better results in the two applied tests, between the initial and the final testing. This program was implemented with the help of specialized teachers in the educational instructional process of physical education and sports lessons, taking place for a period of about 3 months, followed at the end of the testing by data collection and interpretation, to observe the changes resulting in the motor skills of the studied subjects.

Materials and methods

Research protocol

This investigation was overseen in accordance with the Declaration of Helsinki (2013) and approved by the Ethics Committee before the beginning of the study. It also met the ethical standards for Sport and Exercise Science Research. Due to the fact that the general data protection
regulation entered in force on 25 May 2018 (Regulation (EU) 2016/679), which imposes a single set of rules on personal data protection, the tutors of the investigated subjects were provided with an agreement for recording and using personal data. This agreement was signed in two copies by all tutors and provides for the use of records of some motor parameters, then using them while respecting confidentiality, without using the child’s identity.

a) Period and place of the research

The experimenting time frame was extended over a period of 3 months, the initial testing being applied at the beginning of February 2019, over a week. Between the two tests, initial and final, we designed a specific program for the development of the two combined motor qualities, which was used for 15 minutes in each physical education lesson.

The current research and data collection were carried out by means of motor tests, conducted in two state secondary schools in the city of Mediaș - School “George Popa” and School “Mihai Eminescu”.

b) Subjects and groups

In order to carry out this study, we decided to choose a sample of 105 children aged between 9 and 10 years (49 boys and 56 girls), students of two secondary schools in the city of Mediaș.

Both schools were asked for an agreement to enable them to participate in physical education classes, with the purpose of conducting tests and collecting the data needed for the experiment.

The research was prospective in nature, one of the methods used being the quantitative method, which involves collecting and analyzing the data by performing some tests.

The study was conducted during the hours of physical education and sports and was assisted by the teachers responsible for the class.

c) Tests applied

Data collection was carried out following the application of two agility tests: the "T" test and the "L" test.

- The "T" test

This test includes in its process execution, specific types of actions (running forward, running back, running with added steps and changes in direction), which emphasize the development of combined motor qualities, speed and coordination. Being a test in which the speed level is predominantly targeted, the results will be interpreted in seconds.

Test description:

The test consists of a route, using different forms of running, also including certain changes of direction.

Method of performing the test

The teacher places 3 cones at a distance of 5 meters on a straight line (D, B, C), and a fourth cone (A) is located 10 meters from the middle cone (B) so that the four cones form a "T". Cone "A" will represent the starting point and also the end point of the test.

The subject starts with the "start" command from cone "A"; runs at maximum speed up to cone "B", touches the cone; runs with added steps up to cone "C", touches it; keeps moving at speed with added steps to cone "D", touches it; performs the movement with added steps up to cone "B", touches it; then runs at speed with the back to the arrival point represented by cone "A".

The teacher will note the time of each subject separately.

- The "L" test

The "L" test is efficient for monitoring the speed of movement, multidirectional speed and the coordination of the psychomotor system of the body, responsible for adapting the movements, with the purpose of performing it in the most efficient possible way.

Description of the test

The teacher places 3 cones (A, B, C) at a distance of 5 meters from one another, imitating the shape of the letter "L".

The test will start from the right of step (A), with the face to step (B).

At the "start" signal, the subject runs at speed to step (B), touches it; turns and runs back towards milestone (A), touches it; then runs towards milestone (C), bypassing milestone (B) from the outside, touches it; runs back to the starting point, again bypassing milestone (B) from the outside, finishing the test after passing it.

The test results were recorded in a table, and then they were centralized and grouped into categories. As analysis methods, statistical analysis and qualitative analysis were used.

d) Statistical processing

Statistical analysis included descriptive statistics (frequency, percentage, mean, median, standard deviation) and inferential statistics. The D’Agostino & Pearson test was applied to determine the distribution of the analyzed data series. For median comparison, the Mann Whitney test and the non-parametric test for unpaired data were applied. The significance threshold chosen for p value was 0.05. Statistical analysis was performed using the GraphPad Prism.

Results

By analyzing the results presented in Table I, it can be seen that in the male gender the average time obtained in the agility T test, at the initial evaluation, was 15.59±1.591 seconds compared to the final measurement, where we obtained 15.47±1.576 seconds. A 0.12 seconds improvement can be detected, which is considered, using Student t test with a value of p<0.05, to be statistically significant (Table I and Fig. 1).

Also, Table I shows the data for the male gender in the agility L test; at the initial analysis, a result of 11.83 seconds can be seen compared to 11.67 at the final evaluation. The result at the final examination was improved by an average of 0.16 seconds which is considered, using Student t test with a value of p<0.05, to be statistically significant (Table I and Fig. 1).
By analyzing the results presented in Table II, it can be observed that in the female gender, at the agility T test initial evaluation, the average result was 16.75 seconds compared to the final result that was 16.68 seconds, with an improvement of 0.07 seconds from the initial to the final test. The result, using Student t test with a value of p<0.05, is considered not statistically significant in the T test for the female gender (Table II and Fig. 2).

At the agility L test initial evaluation, we registered 12.27 seconds correlated with the final test, where the average was 12.11 seconds, with a 0.16 second improvement. Comparing the results of both calculations, using Student t test with a value of p<0.05, we found a statistically significant difference between the average of the initial and final results in the L-test for the female gender (Table II and Fig. 2).
By correlating the results obtained by both schools (Table III and Fig. 3), it can be seen that “George Popa” school had an improvement of 0.12 seconds between the initial and final results in the agility T test in the male gender, with an initial result of 15.18 seconds compared to 15.06 seconds. “Mihai Eminescu” school also had an improvement of 0.12 seconds between the initial and final results in the agility T test in the male gender, with an initial result of 15.75 compared to 15.63 seconds in the final test. A comparison of the final results between the two schools, using Student t test with a value of p<0.05, showed no statistically significant difference between the final results of the agility T test in the male gender.

A comparison of the final results between the two schools, using the Mann-Whitney test with a value of p>0.05, evidenced a statistically significant difference between the final results of the agility T test in the female gender.

The next step was to analyze the findings obtained by both schools in the agility T test - female gender (Table V and Fig. 5). It can be observed that School “George Popa” had an improvement of 0.12 seconds between the initial and final results in the agility T test in the female gender, with an initial result of 16.05 seconds compared to 15.93 at the final evaluation. School “Mihai Eminescu” showed an improvement of 0.04 seconds between the initial and final measurements of the agility T test in the female gender, with an initial outcome of 17.10 compared to 17.06 seconds in the final test. Comparing the final results between the two schools, using Student t test with a value of p<0.05, evidenced a statistically significant difference between the final results of the agility T test in the female gender (Fig. 7).
At the final evaluation, we correlated the findings obtained by both schools in the agility L test - the female gender (Table VI and Fig. 6): School “George Popa” had an improvement of 0.20 seconds between the initial and final measurements in the agility L test for the female gender, with an initial result of 12.44 seconds compared to 12.24 at the final evaluation. School “Mihai Eminescu” had an improvement of 0.15 seconds between the initial and final results in the agility L test for the female gender, with an initial result of 12.19 compared to 12.04 seconds in the final test. Comparing the final results between the two schools, using the Welch correction with a value of $p>0.05$, no statistically significant difference was found between the final data of the agility L test in the female gender (Fig. 8).

![Figure 6](image1.png)  
**Fig. 6** – The “L” test, initial and final, in female subjects, between the two schools, in seconds.

![Figure 7](image2.png)  
**Fig. 7** – Comparison of initial and final T test values.

![Figure 8](image3.png)  
**Fig. 8** – Comparison of the values of the L-test—initial and final.

<table>
<thead>
<tr>
<th></th>
<th>Female gender</th>
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<th>Female gender</th>
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<td>Mihai Eminescu</td>
<td>L Test Final</td>
</tr>
<tr>
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<td>12.19</td>
<td>Mean</td>
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<td>0.4943</td>
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</table>

Table VI

The results of the “L” test, initial and final, in female subjects, between the two schools.
Discussions

The importance of building motor qualities is an increasingly common topic in research studies, demonstrating each time the positive effects that result from their education.

The motor capacity of an individual adds up to a series of motor manifestations (skills), which, depending on their level of growth, influence the level of efficiency in performing a series of motor acts or actions. This idea was also studied by B. Sebastian in his paper entitled "Study on developing speed and skill through movement games in the basketball game."

In the literature, the importance of developing the nervous system during childhood is discussed very often, stressing that this is the crucial age at which the structures of neurons and the connections between them develop most efficiently, resulting in an improvement of motor qualities based on the speed of nerve impulses.

Developing speed and coordination at an early age, by teachers specialized in physical education and sports, prepares children for possible careers in the sports field, facilitating the work of coaches and thus avoiding stagnation of motor skills.

There is an increasing body of data that support the efficacy of training interventions to develop both the change of direction abilities (Brughelli et al., 2008) and the perceptual and decision-making aspects of agility (Serpell et al., 2011).

The results of the present research indicated significant improvements between the initial and the final examination in both agility tests, agility T test and agility L test. We compared the initial and final results in male subjects and female subjects and then we compared the results in males and females between the schools to see if any statistically significant difference could be found. The results showed a statistically significant difference in comparing the median time obtained by the male gender at the agility T test initial and final evaluation, which was considered, using Student t test with a value of p<0.05, to be statistically significant; also, other statistically significant differences were found in the male gender in the agility L test, using Student t test with a value of p<0.05, statistically significant. Other statistically significant differences were found by comparing the initial and final results in the female gender at the agility T test initial examination. The average result was 16.75 seconds compared to the final result which was 16.68 seconds, with an improvement of 0.07 seconds from the initial to the final test.

Other recent studies found no statistically significant differences in the level of agility between subjects practicing different sports games such as basketball, volleyball or soccer (Horicka et al., 2014). Some scientific papers discovered that agility manifests specifically in many sports; in judo, the agility to start, stop and change of direction ability in sport: A review of resistance training studies. Sports Med. 2008;38(12):1045-1063. doi: 10.2165/00007256-200838120-00007.


Hantiu I. Educație fizică și sport - Teorie și metodică. Ed Univ


The influence of attention in increasing sports performance in football at the age of 7-10 years

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Abstract
Background. The concept of uniform training of children and juniors in football is a requirement that has been increasingly expressed by many technicians. The improvement of distributive attention and focused attention plays an important role in increasing sports performance.
Aims. The study aims to examine the relationship between attention and sports performance.
Methods. Attention was assessed using two testers: the EM – 05.48 C focused attention tester and the combined EM – 05.54, EM 05.55 distributive attention tester.
Results. Following the tests applied, it was found that football players’ performance increased after the training program. Distributive attention registered the following results: the number of correct reactions at the final testing increased by an average of 1.26. The means were 130.27 at the initial testing and 131.53 at the final testing, with a percent increase of 1.0%. The number of erroneous reactions at the final testing decreased by an average of 1.66, the mean values being 5.13 at the initial testing and 3.47 at the final testing. The mean performance at the final testing increased by 0.34, the percent increase of the mean performance being 1.3%. During the experiment, the intervention on the five teams was performed three times a week for 20-25 minutes.
Conclusions. Distributive attention significantly improved following the intervention. Correct reactions increased by 1.26, erroneous reactions decreased by 32.5%, and there was a 1.3 increase in the mean performance at the final testing; the mean increase was not statistically significant, p=0.300>0.05, for Z=-1.036.
Focused attention improved following the intervention, correct responses increased by 16.6%, erroneous responses decreased by 67.8% at the final testing, and performance dispersion registered a decrease of only 3.1%, which means that it was not statistically significant, p =0.887>0.05, for Z=-0.142.
Keywords: football, sports performance, distributive attention, focused attention, sport.
- The rapid perception of a fact, an object or an event is another effect caused by the manifestation of attention.

In order to reach optimum sports performance, it is imperative for athletes to remain focused throughout the duration of a competition. If they manage to focus on essential information and avoid disturbing factors, they have a good chance to perform at the highest level (Crăciun, 2012).

Attention does not have a specific content. It rather designates a condition of mental life due to the fact that the environment in which we live is extremely complex, and we are quite limited in processing information. Depending on the presence or absence of the intention to be attentive, voluntary attention has been differentiated from involuntary attention.

Involuntary attention is defined by the fact that orientation and focus are spontaneous, involuntary and effortless. Voluntary attention does not occur naturally; it is intentional and consciously self-regulated. The selective direction of cognitive and psychomotor activity is based on the regulatory function of language. Attention is focused by self-command or command: “I should be attentive”, based on an adequate motivational stimulus. Voluntary attention supports activity at all times, which is why many researchers consider that voluntary attention is decisive for the development of activity. During competition, attention is focused on the opponent, ready to communicate “key” actions or movements, important for the continuation of the competition. Waiting, anticipating and following the movements are orientations of both perceptual attention and action-based attention, as a preparatory motor attitude, as an anticipation of action (Epuran, 2001).

Researchers have studied the orientation of attention in sport and have found a number of results of which we mention the following:

- All studies show that subjects who participate in open skill sports, such as boxing (Nougier, 1989), hockey (Enns, 1997), pentathlon (Nougier, 1989), football (Lum, 2002), or volleyball (Castiello, 1992), had a higher attention level than novices for orienting their attention in the visual space. Athletes might prefer to pay proportionally less attention to highly probable events and more attention to less probable events. This is unlikely to be the case of athletes who practice closed skill sports (Nougier, 1996).
- Other studies demonstrate that professional athletes can modulate their attention according to the task-specific requirements (Castiello, 1992). More precisely, experienced volleyball players (Pesce, 1998) and professional skiers (Turatto, 1999) showed a better adaptation of attentional focus efficacy, which means that depending on the task, professional athletes are better than novices at modulating the attentional focus dimension.
- Physical exercise or submaximal load leads to a reduction of the reaction time among professional athletes, and especially, for non-valid indices, the attention reaction time decreased (Pesce, 2004).
- Attentional orientation may also have an influence on the control of a motor skill during its execution (Lépine, 1989) or the performance of a decision-making task specific to each sport.

Regardless of its form of manifestation (involuntary, voluntary or post-voluntary), attention evidences a set of highly objectifiable and relatively rigorously quantifiable dimensions, based on which it can be analyzed, compared and evaluated. Among the most important dimensions we mention: volume, focus, stability, mobility and distribution.

“The volume of attention expresses the number of distinct “elements” or “entities” (letters, numbers, syllables, words, geometric shapes, images, objects) that a subject can embrace simultaneously with high and relatively equal clarity (on a perceptive or on a mental plane – representation, imagination)” (Golu, 2005).

Objective

We aimed to study the relationship between attention and sports performance, more precisely, to show the fact that attention is an important predictor of sports performance in football starting with the age of 7-10 years.

Hypothesis

Following the psychological training program proposed for implementation, we assumed that football players might have a significantly higher post-test level of attention and sports performance compared to pre-test values.

Material and Methods

Before initiating the study, the approval of the Ethics Committee of the Faculty of Physical Education and Sport of the “Babeş Bolyai” University in Cluj-Napoca was obtained, as well as the informed consent of the subjects and their parents’ written consent.

Research Protocol

1. Period and Place of the Research

The research was initiated on 1 August 2015, and the intervention program was applied until 20 July 2016. The research was carried out at the training facilities of the sports clubs. Initial testing was conducted in the period 1-10 August 2015. During the experiment, the intervention on the five teams was performed three times a week for 20-25 minutes. The final testing was conducted in the period 10-20 June 2016. During this period, the children had two holidays: from 23.12.2015 to 04.01.2016 and from 29.04.2016 to 16.05.2016.

2. Subjects and Groups

The study was performed in 90 subjects, male athletes aged 9 years, members of the football clubs ACS Best Junior Cluj-Napoca, Star Mediaș, Viitorul Luduș, Arnenopolis Gherla and ACS Satu Mare.

3. Tests Applied

- Focused attention was measured using the EM – 05.48 C focused attention tester. The device controlled by microprocessors is designed based on modern electronic solutions. It is used to examine the stability and oscillation of attention, and it can provide information about the rapidity of observation and understanding, as well as about risk-taking willingness. This machine provides indications about dysfunctions in understanding the work tasks and about the observation capacity performance. The focused attention test can be used in all fields where sustained and continuous attention plays an important role in activity.
Examination using the focused attention tester can be included in the methodology of various studies because measurements also provide information about memory qualities, the focused attention capacity, as well as about the degree of resistance to monotony.

- **Distributive attention** was measured using the combined EM – 05.54, EM 05.55 distributive attention tester. This device for the combined testing of distributive attention, of the focused attention capacity and eye-hand coordination can be successfully used in skill testing, in activities involving a high level of attention. The machine as a testing instrument can also be used for educational counseling. There is a junction between attention and vigilance, which is why the results obtained are an important landmark in the evaluation of a subject’s capacity. The tester can be used in the field of mental skill testing, as well as in scientific research.

**Methods for the development of focused attention**

The subjects were arranged in a line, each with the ball at their foot. Each player executed 3 shots from 8-10 m, at a fixed point: on the goal net, a red card was placed that each subject had to hit. Each subject was given time to focus without being disturbed by the other players. The exercise was performed simultaneously at the two goals, the subjects being divided into two equal groups.

**Methods for the development of distributive attention**

The subjects were placed in two lines facing the goal; each player executed 3 shots from 8-10 m, at a fixed point. Two subjects shot at the goal at the same time, trying to hit the card on the goal net. The exercise was carried out at one goal, while attempting to distract the attention of the two players as much as possible.

Exercises useful for distracting attention and developing distributive attention:

- at the moment of shooting, the coach whistles;
- at the moment of shooting, the coach shouts the name of a subject.

**d) Statistical processing**

The results were statistically processed using the SPSS software (variant V23) and Microsoft Office 2010, Word and Excel. Data were statistically processed using the Student t test.

**Effect size**

The tests for the verification of the statistical hypotheses, through the *p* threshold value, indicate whether there are statistically significant differences between the means of the two tests, but not the size of the difference. The effect size, assessed as small, medium, large, small to medium, etc., quantifies the size of the difference. The size of the difference between the mean results of the two dependent tests (same sample) was evaluated using Cohen’s effect size index.

**Results**

**Table I**

<table>
<thead>
<tr>
<th>Statistical indicators</th>
<th>T I</th>
<th>T F</th>
<th>Z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct responses - Mean</td>
<td>130.27</td>
<td>131.53</td>
<td>0.974</td>
<td>1.26</td>
</tr>
<tr>
<td>Erroneous responses</td>
<td>5.13</td>
<td>3.47</td>
<td>-2.728</td>
<td>0.006</td>
</tr>
<tr>
<td>Progress (mean performance)</td>
<td>26.05</td>
<td>26.39</td>
<td>-0.306%</td>
<td>0.300</td>
</tr>
</tbody>
</table>

**Table II**

<table>
<thead>
<tr>
<th>Statistical indicators</th>
<th>T I</th>
<th>T F</th>
<th>Z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct responses - Mean</td>
<td>21.73</td>
<td>25.33</td>
<td>-2.560</td>
<td>0.010</td>
</tr>
<tr>
<td>Erroneous responses</td>
<td>3.93</td>
<td>1.27</td>
<td>-3.319</td>
<td>0.001</td>
</tr>
<tr>
<td>Progress (mean performance)</td>
<td>19.53</td>
<td>19.82</td>
<td>-0.142%</td>
<td>0.887</td>
</tr>
</tbody>
</table>

**Discussions**

In conclusion, from a psychological point of view, attention is a form of mental life, which applies to various contents and consists of a focusing of consciousness on a limited area. Attention is a synthesis function, gathering all available data and resources around an object or a phenomenon. It is a state of relative monoideism facilitated by the intervention of motivation and emotions. A role is also played by previously acquired knowledge and skills. The solution of voluntary attention problems depends on the progress made in the study of volition.

The attention focusing capacity varies significantly from one individual to another. It is an expression of the entire personality, mainly expressing its aspirations (Cosmovici, 1996).

In Table I, it can be seen that the number of correct reactions increased at the final testing by an average of 1.26. The means were 130.27 at the initial testing and 131.53 at the final testing. The percent increase was 1.0%. The dispersion of the results of both tests was homogeneous. The difference between the means was small to medium. The increase in the number of correct reactions was not statistically significant, *p*=0.330>0.05, for *Z*=0.974. The null hypothesis was accepted.

The number of erroneous reactions decreased at the final testing by an average of 1.66, the mean values being 5.13 at the initial testing and 3.47 at the final testing. The percent decrease in erroneous reactions was 32.5%. The dispersion of the data of both tests was inhomogeneous. The difference of the means was medium to large. The number of erroneous reactions decreased significantly, *p*=0.006<0.05, for *Z*=-2.728. The null hypothesis was rejected (Table I).

The mean performance increased at the final testing by 0.34, the mean values being 26.05 at the initial testing and 26.39 at the final testing. The percent increase in the mean performance was 1.3%. The results were homogeneously dispersed in the case of both tests. The difference between the means was small to medium. The mean increase was not statistically significant, *p*=0.300>0.05, for *Z*=-1.036. The null hypothesis was accepted (Table I).

The correct responses for focused attention increased at the final testing by an average of 3.60. The mean values were 21.73 at the initial testing and 25.33 at the final testing. The mean percent increase was 16.6%. The dispersion of responses was inhomogeneous at the initial testing and relatively homogeneous at the final testing. The difference between the means was medium to large. The mean increase of correct responses for focused attention was statistically significant, *p*=0.010<0.05, for *Z*=-2.560. The null hypothesis was rejected (Table II).

The mean number of erroneous responses for focused
attention decreased at the final testing by 2.66, the mean values being 3.93 at the initial testing and 1.27 at the final testing. The percent decrease of erroneous responses was 67.8%. The dispersion of the results of both tests was inhomogeneous. The difference between the means was large to very large. The decrease in the mean number of erroneous responses was statistically significant, \( p=0.001<0.05 \), for \( Z=-3.191 \). The null hypothesis was rejected (Table II).

The results recorded for the dispersion of focused attention decreased at the final testing by an average of 0.61, the mean values being 19.53 at the initial testing and 18.92 at the final testing. The percent decrease of dispersion was 3.1%. The results obtained were inhomogeneously dispersed in the case of both tests. The difference between the means was very small. The decrease in the dispersion of focused attention was not statistically significant, \( p=0.887>0.05 \), for \( Z=-0.142 \). The null hypothesis was accepted (Table II).

Conclusions

The results obtained following the two tests, initial and final, demonstrate that the introduced variable caused progress, focused attention as well as distributive attention being significantly improved at the final testing.

Distributive attention was considerably improved following the intervention. Correct reactions increased by 1.26, the number of erroneous reactions decreased by 32.5%, and there was a 1.3% increase in the mean performance at the final testing; the mean increase was not statistically significant, \( p=0.300>0.05 \), for \( Z=-1.036 \).

Focused attention improved following the intervention, correct responses increased by 16.6%, erroneous responses decreased by 67.8% at the final testing, and there was a decrease of only 3.1% in the dispersion of performance, which means that it was not statistically significant, \( p=0.887>0.05 \), for \( Z=-0.142 \).

Conflicts of interests

Nothing to declare.

Acknowledgments

The article uses results from the first author’s doctoral thesis, which is ongoing at the Faculty of Physical Education and Sport of the “Babeş-Bolyai” University in Cluj-Napoca.

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REVIEWS

Biocrystallization test for early determination of oxidative stress

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Abstract

Oxidative stress is an imbalance of oxidants/antioxidants in favor of oxidants as stated by Sies in 1985, and may arise due to excessive sports, physical and mental stress, high altitude exposure, diets, temperature variations, extreme cold or heat weather, smoking, hypoxia, immobilization stress and so on. It is also the main cause of the most common illnesses of the current age: cardiovascular disease, diabetes, infection, chronic fatigue syndrome, depression, malignancy, and neurodegenerative disorders. The early determination of oxidative stress, although important for health, is not always simple and often requires laborious and expensive analysis. Biocrystallization, also called sensitive crystallization, is a simple and inexpensive qualitative method used for almost 100 years in the study of herbs, foods and also in human health for orientation of diagnosis. The method also allows a rapid assessment of the therapeutic effectiveness of remedies or recommended procedures for patients with a certain pathology. In this paper we are looking to answer the following question: is it possible to use this method in order to assess the level of oxidative stress induced by varying environmental or internal factors and to observe the efficiency of the treatment?

Keywords: biocrystallization, oxidative stress, carbonyl stress.

Introduction

Oxidative stress is an imbalance between all oxidants and antioxidants, in favor of oxidants (Sies, 1985). High levels of oxidants can be the result of exogenous exposure or endogenous production of various reactive oxygen species (ROS), reactive nitrogen species such as nitric oxide and peroxynitrite (Sies, 1997), reactive carbonyl species (RCS), reactive sulphur species (RSS) and reactive selenium species (RSeS), which exceeds the level of internal antioxidant defense mechanisms or the ability to repair the damage caused by ROS to cell proteins, lipids and DNA.

It may arise due to sport activities (Dejica, 2000), physical and mental stress, diets, high altitude exposure, temperature variations, extreme cold or heat weather, hypoxia, immobilization stress, smoking (Bidian & Tache, 2007), aging, diabetes, ischemia, infection, uremia, hypertension, malignancy (Manolescu, 2011), as well as muscle injury and inflammatory disease processes, including hyperthyroid myopathy, sepsis (Ploesteau, 2018).

Physiological implications

Free radicals and other oxidant non-radicals have important physiological roles through redox sensing and redox signaling as long as they remain within certain limits, which is termed oxidative eustress or physiological oxidative stress, positive oxidative stress (Yan, 2014; Pizzino et al., 2017).

Pathological implications

Toxic and excessive oxidative burden is named distress (Sies et al., 2017). The level of oxidative stress is very important in human health because it can be involved or can be a basis for cancer (Halliwell, 2007), neurological degenerative diseases such as Parkinson’s disease (Hwang, 2013), Alzheimer’s disease (Valko et al., 2007), for the main cardiovascular diseases including atherosclerosis (Bonomini et al., 2008), myocardial infarction (Ramond et al., 2013; Dean et al., 2011), heart failure (Singh et al., 1995), genetic diseases such as Lafora disease (Romani-Mateo et al., 2015), fragile X syndrome (de Diego-Otero et al., 2009) and sickle-cell anemia (Amer et al., 2006),
mental and developmental diseases such as ADHD (Joseph et al. 2015), Asperger syndrome (Parellada et al., 2012), autism (James et al., 2004) and depression (Jiménez-Fernández et al., 2015), dermatological diseases such as lichen planus (Aly and Shahin, 2010) and vitiligo (Arican & Kurutas, 2008).

**Oxidative damage**

There are multiple proposed mechanisms through which oxidative stress might reduce important health status processes such as cardiac and neurological function, and the first is by damaging cellular proteins, lipids and membranes, DNA, RNA and microRNA oxidation, thus inducing cellular dysfunction or death through apoptosis and necrosis. Recently, in diabetes mellitus, “carbonyl stress” was described, which is characterized by accumulation of reactive carbonyl compounds having deleterious effects upon the target biomolecules (Oprea et al., 2013). Because of these very important consequences, early determination of oxidative distress and even its surveying can be needed.

**Methods and indicators for oxidative stress**

Exploring the oxidative status of the body can be performed in the following 6 ways (Nemes-Nagy et al., 2012):

1. Free radical measurement by absorption spectroscopy.
2. Measurement of chemical uptake (chemical trapping) by quantitative determination of the elimination of specific derivatives of salicylic acid, hydroxylated or nitrosylated compounds.
3. Measuring the antioxidant capacity of each antioxidant or total plasma antioxidant capacity.
4. Determination of antioxidant enzyme activites (SOD, CAT, GPX) and non-enzymatic antioxidants (Dejica, 2000, 2001).
5. Measurement of biological compounds resulting from oxidative processes.

**Non-invasive methods**

In the last years, a range of non-invasive assay systems for oxidative status using spectrophotometric analysis of the redox state of mitochondrial and extramitochondrial cytochromes, redox-sensitive two-photon microscopy, electron spin resonance (ESR), electron paramagnetic resonance (EPR), genetically encoded fluorescent protein indicators and other fluorescent probes was presented (Sies et al., 2017).

**Invasive methods**

For evaluation of the oxidative stress level, we currently use a panel of standardized or unstandardized serum markers such as gamma-glutamyl transpeptidase, advanced oxidation protein products, thiobarbituric acid reactive substances, serum albumin, serum uric acid level (Manolescu et al., 2011), lipoperoxides and aldehydes (Muresan et al., 2006), oxidized low density lipoprotein (LDL) particles, total antioxidant capacity of serum (Re et al., 1999), total thiols and non-proteic thiols (Himmelfarb et al., 2000), concentration of protein carbonyls (Hawkins et al., 2009), hipoxantin (Tache, 2001) ceruloplasmin (Sunderman & Nomoto, 1970; Tache, 2000). In the last years, concentrations of 8-Oxo-2’-deoxyguanosine and 8-hydroxyguanosine within a cell have been a measurement of oxidative stress (Valavanidis et al., 2013). Such determinations are not widely available, so the use of simple methods for monitoring oxidative stress such as biocrystallization can be welcome.

**Biocrystallization**

The first biocrystallization experiments were conducted in 1922-1923 (Pfeiffer, 1930; Pfeiffer, 1968). Ehrenfried Pfeiffer and his team tested many inorganic salts and in 1925 they completed the sensitive crystallisation method based on dehydrated copper chloride (CuCl₂·2H₂O), the most sensitive salt with respect to the added substrate.

**The principle of biocrystallization**

Pure dehydrated copper chloride solution crystallizes in an orthorhombic system, forming fine needles, conglomerated in deposits. When a small amount of biological substance is added to the copper chloride solution, typical crystalline formation is completely inhibited, crystals increase several thousand times in volume and appear as unspecific dendritic or curved forms (Shibata et al., 1994). This phenomenon can be used as a morphological test.

An important experiment for understanding this type of sensitive crystallization was made by Shibata et al. in 1998 using X-ray photo-electric spectroscopy of the copper chloride network derived from a solution containing human blood. This test showed that the atoms in the added biological substrate (nitrogen, carbon or oxygen atoms) are absorbed at the surface of the copper chloride crystals, where there is a phenomenon of exchange of copper chlorine peripheral electrons, but they cannot be detected anywhere within the copper chloride crystals. In this experiment, the conclusion was that these elements (nitrogen, carbon and oxygen) influence only the morphology of copper chloride crystallization. Another study conducted in France by Charpentier showed that electric and magnetic fields have no influence on biocrystallization (Charpentier et al., 1998).

The most important influence of any additive is on the growth process (Reiter & Barth, 2010). Crystallization has two important elements: a growth process and a nucleation (Leray, 1968). Both parts of the phenomenon are influenced and controlled by concentration or temperature, and can only occur at concentrations higher than saturation concentration and at temperatures below the melting point.

**Biocrystallization test in human and veterinary health**

The blood biocrystallization test is a minimally invasive analysis using a solution of hemolyzed capillary blood as an additive in the process of copper chloride crystallization. Fresh or dry blood samples can be used. The freshly taken samples of blood provide more accurate images than those taken on filter paper which become dry and are used after more than six days. The time of taking the blood samples is also important. The most appropriate time interval is between 8-9 a.m. on an empty stomach, and for women...
Biocrystallization test for early determination of oxidative stress

it is best to avoid giving samples two days before and two
days after the menstrual cycle (Bessenich, 1953).

This method has been used over time in health as a
guiding diagnosis of any type of disorder, both in humans
and animals, to specify general health, vitality, aging and
even for early diagnosis of cancer.

The first studies were performed by Pfeiffer (1927-
1961). The method was soon put into practice by other
doctors, who confirmed Pfeiffer’s results. Krebs in 1940
considered the blood crystallization test useful for early
detection of cancer because positive results were shown in
the case of susceptible strains of animals.

For diagnosis of various diseases, we mention the
studies of Begouin (1938), Pfeiffer and Miley (1939),
Trump and Rascher (1939), Seigle (1939), Isabel (1940),
Rohlofs (1944); Krebs (1947); Kubin (1954); Bourgeois
(1954); Beckmann (1959); Bessenich (1960); Spielberger
(1983); Barth (1984, 1985); Hoffmann (1985); Gulati
(1994), Kuczkowski (1995), Cocude (1998); Piva (1998);

The test also indicates the general terrain of vitality,
e.g. oxidative, anemic, fibrotic, sclerotic, inflammatory,
congestive, and can evaluate aging (Cocude et al., 1992;
Selawry & Selawry, 1957; Selawry 2008; Shibata 1996).

Indicators of biocrystallization test

The evaluation of crystalline patterns use the notions of
well or weak centered and coordination (Selawry &
Selawry, 1957), and the notions of structure and texture
(Barth, 1997). The crystalline structure refers to the main
branches which depart from the center to the periphery.
The texture is formed by fine crystals which depart from
the main branches and form a more or less dense structure
that covers up the surface of the plate.

For blood testing, the Pfeiffer or Selawry evaluation
is used according to the individual case. Unlike the
crystallization image of pure copper chloride which
does not have a main center but a set of small crystalline
clusters independent of each other, the image of sensitive
crystallization of the blood of a healthy person is an
organized, centered ensemble that reflects the unity.

The weakening of coordination, reflected in
the appearance of secondary crystallization centers
individualized to the general radiant structure, occurs in
the case of various diseases, but especially in cancerous
patients. Alternatively, the reduction in coordination is
expressed by crystal density differences between regions
of the same crystallization plate.

Strips are more vaguely drawn, fewer and more terrible
in the case of a strong diminution of vitality, as it happens
especially shortly before the moment of death, when the
image of crystallization is closer to the specific image of
crystallization of pure chlorine (Selawry, 2008)

Indicators of oxidative stress

Oxidative stress can be diagnosed using the
biocrystallization test from the early stages in which clinical
or paraclinical signs are reduced. The main indicators are
primarily texture and “anarchic structures”, along with
specific forms for inflammation, fibrosis and sclerosis. The
first oxidative stress indicators are changes in the texture
appearance of the crystallization image, namely a tendency
towards a mineral type that can be localized in the case of
fibrosis or cirrhosis or generalized in some cases where
the patient has been subjected to prolonged physical or
psychological effort. In the more advanced stages, this
specific type of texture can overlap the fibrosis-specific
forms (“brush shapes”). Under prolonged oxidative stress,
a fine and dull texture specific to sclerosis, with very
fine vacuoles at the periphery can be seen as a very clear
cut, as if done with scissors. The texture of large spaces
between rays occurs in situations with excessive oxidative
metabolism (thyrotoxicosis), when gaps have a somewhat
rough appearance. If the general appearance is lacunar-
pale, weak in forms, with a lack of oxygen, it indicates
anaemia. Clearly outlined gaps indicate a tendency to
sclerosis (Selawry, 2008).

Within the texture, superimposed elements can indicate
local or general oxidative stress as shown in Table I.

<table>
<thead>
<tr>
<th>Specific sign</th>
<th>Encountered</th>
<th>Characteristics</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>elements of fibrosis</td>
<td>fibrosis, conjunctive tissue reactions (i.e. postoperative scars)</td>
<td>a brush shape, with an angle of less than 30° in the case of chronic inductions and a fan shape, with an angle of more than 30° in the case of cirrhosis or subacute inflammation</td>
<td>Selawry, 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Piva et al., 1994</td>
</tr>
<tr>
<td>elements of inflammation</td>
<td>acutely localized inflammations, allergies</td>
<td>star formation, or smaller forms of rudimentary stars (“sparks”)</td>
<td>Selawry, 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Piva et al., 1994</td>
</tr>
<tr>
<td>elements of necrosis</td>
<td>tubercular caverns, pulmonary abscesses, necrotic tumours</td>
<td>Maltese cross (with more or less symmetrical arms, with 3 or 4 arms)</td>
<td>Selawry, 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Piva et al., 1994</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Donadio, 1950</td>
</tr>
<tr>
<td>‘transverse form’ (‘anarchic structure’) stage I and II</td>
<td>atypical oblique elements in stage I, and more perpendicular, more clearly delimited and denser atypical oblique elements in stage II</td>
<td>local functional changes induced by oxidative stress, arteriosclerosis, sclerosis, fibrosis, liver cirrhosis, artherosclerosis, degenerative bone processes and in the case of benign tumors, leukoplakia of the oral mucosa</td>
<td>Selawry, 1980</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Piva et al., 1994</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vara et al., 1994</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sarode, 2013</td>
</tr>
<tr>
<td>‘transverse form’ (‘anarchic structure’) stage III and IV</td>
<td>atypical oblique and perpendicular elements, more numerous and often containing short stripes that partially disrupt (phase III) or completely disrupt (stage IV) the general radial distribution</td>
<td>malignancy, cancer</td>
<td>Selawry, 1980</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Piva et al., 1994</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pfeiffer, 1930</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Barth, 1990</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sarode, 2013</td>
</tr>
</tbody>
</table>
If persistent oxidative stress is predominantly located in organs and tissues, a disordered appearance of the crystallization network, named by Barth “anarchic forms or structures”, may appear over time in the area on the crystallization image that is appropriate to that organ, or sometimes even with wide distribution on the plate. Pfeiffer and Selawry named these specific structures “transverse elements”.

These elements go through four stages, described by Selawry (1957, 2008), which can precede by 3-4 years the physical appearance of organic changes and is the expression of local functional changes induced by oxidative stress. If therapeutic intervention occurs in Stage I or II, where there are only functional disorders due to local oxidative stress, the progression to structural changes can be reversible and can also be followed by sensitive blood crystallization, finding the gradual disappearance of “anarchic forms” on the crystallisation image.

Stages I and II are found on crystallization images made of aged animal or plant tissue extracts, and in the case of various diseases caused by oxidative stress: arteriosclerosis, sclerosis, fibrosis, liver cirrhosis, arthrosis, degenerative bone processes, and in the case of benign tumors (Selawry, 1980) as well as in premalignant lesions such as leukoplakia of the oral mucosa (Rawat et al. 2018).

In Stage I, atypical oblique elements are present, which become more perpendicular, more clearly delimited and denser in Stage II. At the time of the malignant tumor appearance, these elements are more numerous and often contain short stripes that partially disrupt (stage III) or completely disrupt (stage IV) the general radial distribution. They are called anarchic structures because they are an element of “anarchy” for the general order of the crystallization image (Selawry, 1980).

Comparison of biocrystallization with the current methods of O/AO balance analysis

The assessment of oxidative status is complex and involves the measurement of various parameters of the O/AO balance and their correlation. In contrast to the current methods for evaluating oxidative status, the superiority of biocrystallization resides in providing an overview of the health status and thus allowing discrimination between oxidative eustress that is associated with the health status and thus allowing discrimination between oxidative stress. If therapeutic intervention occurs in Stage I or II, where there are only functional disorders due to local oxidative stress, the progression to structural changes can be reversible and can also be followed by sensitive blood crystallization, finding the gradual disappearance of “anarchic forms” on the crystallisation image (Selawry, 1980).

Discussions

The results obtained by different workers under different laboratory conditions show a similar pattern of biocrystallization tests in normal healthy individuals. This specific pattern is completely changed when copper chloride crystallizes from solutions containing impurities, especially proteins such as proteins from human blood (Gruner, 1940; Bercy, 1995). These proteins or various protein degradation products (amines) are considered responsible for the specific biocrystallization pattern in oxidative stress, cancer, inflammation, allergies or other specific pathologies. It is known that oxidative stress is associated with a significant decrease of glutathione, which is a tripeptide (Schafer & Buettner, 2001).

The most important long-term effect of oxidative stress and ionizing radiation is DNA damage, also involved in aging and oncogenesis (Evans & Cooke, 2004). The biological effects are the increase of 8-oxoguanine and thymine glycol. 8-Oxo-2’-deoxyguanosine (8-oxo-dG) is an oxidized derivative of deoxyguanosine and one of the major products of DNA oxidation (de Souza-Pinto et al., 2001). Concentrations of 8-oxo-dG and 8-hydroxyguanosine in white blood cells or urine are a measurement of oxidative stress. Valavanidis et al. (2013) considered that increased 8-oxo-dG levels in tissues can serve as a biomarker of oxidative stress and also observed increased 8-oxo-dG levels during carcinogenesis. Also, tissue 8-oxo-dG levels increase with age (Nie et al., 2013; Hamilton et al., 2001). Oxidative stress also rises in conditions of fatigue, lack of sleep, prolonged working hours, workload, psychological trauma, the impossible prospect of alleviating stress being evidenced by significantly increased formation of 8-hydroxydeoxyguanosine (8-Oh-dG) (Srivastava & Kumar, 2015; Masahiro et al., 2001).

This DNA damage phenomenon may be accompanied by specific protein synthesis and it is known that the biocrystallization test is especially sensitive to blood protein levels.

Proteins are one of the main targets of ROS, leading to the formation of carbonyls and other oxidized moieties (Kehre & Smith, 1994). The highly reactive ROS can lead to protein denaturation among others.

Human and animal studies report that high altitude induces a rise in proteins, DNA and lipid oxidative damage (Bakony & Radak, 2004). The study of Radak et al. published in 1997 demonstrates that training at 4000 m altitude increased carboxylation of certain muscular proteins, probably actins. Hypoxia can be involved in oxidative protein damage. Anaerobic exercise increases the accumulation of reactive carbonyl derivatives in the lung of rats (Radak et al., 1997; Radak et al., 1998).

It is considered that the “anarchic structures” which are the main indicators of oxidative stress appear due to changes in the protein content of the analyzed serum. Many enzymes are implicated in endogenous or exogenous oxidative stress, some of them being involved in the generation of oxygen or nitrogen free radicals (NADPH oxidases, xanthine oxidase, mitochondrial respiratory enzymes, cytochrome P450, cyclooxygenases, lipoxygenases, peroxisomal enzymes, nitrogen synthases). Others are involved in antioxidant processes (SOD, catalase, peroxidases, hemoxygenases). Enzymes, however, are macromolecules of protein origin. A series of protein compounds that do not have enzymatic activity such as serum albumin, thioredoxins and proteins involved in transition metal ion binding such as ferritin, transferrin, haptoglobin, hemopexin, ceruloplasmins, metallothioneins have an antioxidant role. Glutathione is a tripeptide. In conclusion, we find that numerous protein molecules are involved in the oxidative balance. It is possible that “anarchic structure” may arise as a result of changing the serum ratio of these protein molecules under conditions of endogenous or exogenous oxidative stress.

The blood biocrystallization test has been used in
Conclusions

1. The test can be useful for monitoring the oxidative stress induced by sport activities, physical or mental stress.
2. The superiority of biocrystallization can reside in providing an overview of the health status and thus allowing discrimination between oxidative eustress and the development of oxidative distress as well as its progression.
3. The biocrystallization test is especially sensitive to blood protein levels, so it can evidence variations of serum protein oxidative stress markers.
4. This test can be useful to evaluate carbonyl stress related to prediabetic and diabetic conditions.
5. It can be useful for early detection of precancerous cases.
6. It is a possible screening method for malignancy, especially in individuals with high risk or genetic predisposition.
7. It can be useful especially when the localization of malignancy or precancerous lesions is inaccessible to biopsy, and is correlated well with the histopathological grades I and II.

Conflict of interest

The authors declare no conflict of interest. The funding laboratories had no role in the study design, in the collection, analysis and interpretation of data, in the writing of the report and in the decision to submit the paper for publication.

Declarations

Author contribution statement
Cristina Cîmpean: analyzed and interpreted the data; wrote the paper.
Mihai Berteau: analyzed and interpreted the data; wrote the paper.

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Intermittent fasting in athletes: PROs and CONs

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Abstract
Weight loss is nowadays a hot topic for average people as well as for athletes. Intermittent fasting, an alternation between fast periods and normal eating periods, is the newest, in vogue diet trend to lose weight. It is not a calorie-restricted eating plan, it is a time-restricted approach. Whether intermittent fasting is good or bad, that depends on many factors. Although it could be considered a part of normal life, a life changer for some people, it might become a disaster for others.

There are many fasting protocols depending on the extent of fasting hours (from 12 to 20 hours a day) or days (from 1 to 2 days a week or more), the most observed type being the 16:8 model. The best individual plan for eating is seldom found by experimentation; what is important is to focus on healthy eating, to avoid/limit junk food, and to avoid dehydration.

In athletes, competing during intermittent fasting is contraindicated, and endurance training in fasting periods might boost the post-exercise recovery. So far, studies sustaining intermittent fasting have been contradictory and inconclusive, and the research methodology is not yet standardized. This type of eating habit could have many advantages as long as fasting is done wisely, and many disadvantages, with extra risks in athletes compared to average people.

Keywords: athletes, intermittent fasting, weight loss.

Introduction
Alongside water, air, shelter and a stable global environment, food is one of the 5 fundamental human needs. The criticism of rational nutrition was mentioned 2,500 years ago, and the accumulation of food and nutrition information during the last century was explosive. Nowadays we are witnessing a real “nutritional cacophony” in which it is difficult to choose between true and false, good and bad (Laza, 2017).

Human beings need a proper and energetically adequate diet, any (totally/partially) excessive or (totally/partially) poor nutrition regimen having serious effects on their health status.

The world population is currently confronted with a lack of food (famine, poverty), which affects over 800 million people, as well as with an excess of food, which in association with a sedentary lifestyle determines overweight and obesity, with serious obesity-associated conditions (Alamgir Khan et al., 2018).

Over centuries, physical beauty standards have evolved, and nowadays being overweight/obese is no longer a sign of wellness. Global epidemic obesity has allowed some companies to develop a plethora of more or less efficient and sustainable weight loss schemes. In recent years, weight loss has been a hot topic for average people, as well as for athletes, regardless of the level of exercise. Intermittent fasting (IF) is the newest, in vogue diet trend to lose weight. IF means an alternation between fast periods and normal eating periods (non-fasting or feast days/hours). So far, studies sustaining intermittent fasting have been contradictory and inconclusive, showing both health benefits and detriments (the research methodology is not yet standardized) (De Cabo & Mattson, 2019).

IF is not a diet, it is a time-restricted (scheduled approach) and not a calories-restricted eating plan, recreating the forced fasting of ancient humans during hunter-gathering periods. Our ancestors did not have the luxury of having a meal every 2 to 3 hours, yet they still enjoyed better physical health than most of us today. Some people might fast unknowingly by eating an early dinner and skipping breakfast the next day, so IF could be considered a part of normal life. Whether IF is good or bad, that depends on many factors; it could be a life changer for some people or a disaster/nightmare for others, depending on the aim, health status, and sex (Patterson & Sears, 2017).

Fasting is not similar to starvation. While starvation is an involuntary and severe absence of food for a long
period of time, leading to serious suffering or even death, fasting is deliberate, controlled deprivation of some or all foods, beverages or both for a set period of time (a few hours up to a few days or weeks).

Fasting periods are often called “purification”, “detoxification”, or “cleanses”. Intermittent fasting has no standard duration and could follow many models. There are many fasting protocols: shorter fasts (less than 24 hours), longer fasts (over 24 hours), and extended fasts (over 48 hours) (De Cabo & Mattson, 2019).

### Shorter fasts

Are the most frequent intermittent fasting type:

The **12:12 model** means that a person fasts 12 hours out of 24, and the 12 remaining hours has a normal calories intake. Most of the types of fasting also include sleep hours.

The **16:8 model** is the most indicated and used type of IF, meaning that 8 hours represent the “eating window”, and 16 hours represent the “fast window”. This form is applied daily or almost daily, being very flexible. Practically, the first meal of the day could be at 9:00 am and the last one at 5:00 pm, so the “fast period” is between 5:00 pm (day 1) and 9:00 am (day 2), or between 6:00 pm and 10:00 am, or from 7:00 pm to 11:00 am, or 8:00 pm - 12:00 am, respectively. During the fast window, all daily calories can be consumed without restriction.

This protocol is easy to follow, being supported by the daily circadian rhythm, and can be adapted to a person’s preference. It is important to consume dinner 2-3 hours prior to sleep (eating within 2-3 hours interferes with sleep quality and could promote weight gain) (Yamaguchi et al., 2013). Sometimes, the best individual plan for eating is found by experimentation. It is also important to focus on healthy eating (high-fiber, vegetable-rich diets), and to avoid/limit junk food. During the 16 fasting hours, regularly drinking water is extremely important to avoid dehydration. Other calorie-free beverages are tea (e.g. cinnamon herbal tea may suppress appetite) and coffee.

The **20:4 model** (also named the **warrior diet**) extends the fast period to 20 hours, the eating window being within the 4 remaining hours (e.g. from 2:00 pm to 6:00 pm) (1).

### Longer fasts

**Full day fasting (FDF)** spans 24 hours (from dinner to dinner, or from lunch to lunch), 2 to 3 times a week (it is known as the Eat-Stop-Eat diet). Practically, people eat at 10:00 pm on day 1, the next meal being at 10:00 pm on day 2. The meal is quite low in calories, and so the weekly caloric intake is diminished. Despite some benefits, this regimen is highly contraindicated in athletes competing in endurance sports, because through it the body uses fat for energy, and endurance sports demand a quicker way to obtain the necessary fuel (Horne et al., 2013).

**Weekly 24-hour fasting**: during 24 hours per week, the person fasts completely and consumes only liquids (Leonard, 2018; Gunnars, 2017). For different reasons (spiritual, dietary, medical), along with meditation, **water fasting** is nowadays quite popular in the wellness movements. Some people may not eat and drink nothing but water, but this is not safe for everyone. Long water fasting for days is not advised, a safer alternative being preferable.

The **5:2 fast** represents the most popular and studied protocol, involving 5 regular eating days and two fasting days (which should not be consecutive). During the fasting days, the diet offers no much than 500-600 calories as a single meal or spread throughout the day. A model related to 5:2 is to fast every other day (**alternate day fasting - ADF**), which implies a caloric intake restriction to around 25% of the usual intake (Leonard, 2018; Gunnars, 2017). In humans, ADF might boost the ability of aerobic exercise to increase endurance (the muscle uses fats and ketones as fuel instead of carbohydrates), improves overall health and reduces risk factors for diabetes and cardiovascular diseases (Kroeger et al., 2018; Varady et al., 2013).

The **36-hour fast** means that the fasting window is for 36 hours (from dinner on day 1 to breakfast on day 3).

### Extended fasts

They are from 7 to 14 days most frequently and are only possible for some people, the risks of complications being high (vitamin, mineral and fluid imbalance) (Bertile et al., 2016).

### Metabolic changes during fasting

Human daily calorie needs are 1,600-2,400 for women, and 2,000-3,000 for men, depending on age, size, height, lifestyle, health status, and activity level. As people get older, caloric needs diminish because their metabolic rate also decreases (1,600 calories a day after 51 years of age). Caloric intake is covered by glycogen and fat ingested or deposited. During the fed state, the blood insulin level rises and stores the glucose (sugar) in liver and muscle as glycogen (Chaouachi et al., 2009). When the storage space for glycogen (limited but easily accessible) is reached, the liver turns the excessive glucose into fat (fat deposits in the body are huge, but more difficult to access). The liver glycogen deposit is rapidly depleted, and then liver glycogenolysis starts to properly supply glucose to the brain, while the muscle glycogen stores are little affected or unaffected.

During the fasting state, the insulin level falls and the body burns the stored glycogen and fat. The low level of insulin causes the blood vessels to expand and hence, there is more flow of oxygen and nutrients serving the working muscle and the other organs. After 8 to 12 hours of fasting – depending on the level of blood glucose - the body tries to preserve the little amount of blood sugar and rely on fat. As the body starts using fat as fuel, the hormones which regulate sugar and fat (growth hormone, cortisol, glucagon, adiponectin) and the growth hormone and adrenaline (also called epinephrine) are very high. Hormonal changes during IF could elevate blood sugar production (the dawn phenomenon) (Rybricka et al., 2011). The dawn phenomenon (the dawn effect) is an abnormal increase in blood sugar in people with diabetes between 2 am and 8 am. It is explained by a natural overnight release of counter-regulatory hormones which increases insulin resistance, raising the blood sugar.
**PROs and CONs of IF in athletes**

Time-restricted eating regimens allow people to eat anything they want with rapid weight loss (Patterson & Sears, 2017).

IF is not a miracle weight-loss treatment, but is indicated for those who are lightly/moderately physically active, if they want to lose weight, to reduce glycemia, to reduce gut inflammation or to improve their intestinal microbiome.

**Health effects of IF**

Some of which have been known since ancient times:

* Weight and fat loss while the muscle mass is maintained: 0.2 to 0.8 kg/wk (Davis et al., 2016), or 4-15% weight loss in overweight (Tinsley et al., 2015; Varady, 2011; Wilson et al., 2018).

* Diminished hunger and food cravings. Hunger comes and goes like a wave; it should be ignored and disappear after drinking a cup of tea/coffee (2). In longer fasts, hunger might increase on the next day and recede gradually to completely disappear by days 3-4, when the body energy is covered by fat. Eating a low-carb, ketogenic diet between fasting periods will reduce hunger (3).

* Improved metabolic health and restored insulin sensitivity (by 20-31%) and lower cholesterol (LDL cholesterol decreases by 21% and triglycerides by 32%) and lower belly fat (Patterson et al., 2015; Chung et al., 2011; Chung et al., 2016). When the body cells are resistant to insulin, the body is more likely to store the eaten food as fat, and insulin resistance causes inflammation (4).

* Decreased blood pressure and heart rate, and hence the heart health may improve, notably when weight loss is associated (5).

* The body becomes metabolically flexible (easily able to burn fat as fuel and preventing the loss of lean mass). Varady showed in obese people only a 10% lean mass loss during IF, compared with 25% lean mass loss during daily caloric restriction (Varady, 2011; Barnosky et al., 2014).

* Human growth hormone (HGH) levels increase by 2,000% during 24-hour fasting in men and by 1,300% in women. HGH enhances muscle recovery and growth (increased protein synthesis), wound healing, and speeds up fat loss (Varady et al., 2008).

* Great for the brain: in fasting environment, a hormone named brain-derived neurotrophic factor (BDNF) is increased and as a result new nerve cells will grow more effectively (Shojai et al., 2017; Malinowski et al., 2019; Fann et al., 2017).

* Activates the sympathetic nervous system responsible for our fight-or-flight response (heart rate increases, digestion slows, and muscle tension increases) (Malinowski et al., 2019).

* Chronic disease prevention. IF is good in preventing diabetes (but is not indicated for those who already have this disease) and cardiovascular diseases (in mice and rats, IF seems to reduce the risk of coronary artery disease; in humans, skipping breakfast and eating a late big meal at dinner elevates 5 times the risk to die from a heart attack, but these people are also likely to have other bad habits such as smoking, sedentary lifestyle, high stress, and long working hours); in some cancers, hypertension, non-alcoholic fatty liver disease, and inflammatory bowel disease. How and why fasting reduces inflammation is probably explained by the fact that it produces fewer monocytes, the main reason for a healthy and long life in fasting subjects (Harvie et al., 2011; Harvie et al., 2013; Varady et al., 2013).

* Delayed aging. One hypothesis is that fasting can activate cellular mechanisms that boost immune function and reduce inflammation associated with chronic diseases (4). Despite the complexity of aging, the common process is a structural and functional progressive decline of the whole body, often preceded by a phase of chronic morbidity, which leads to death. Caloric restriction (CR) during fasting periods is a powerful, efficient approach influencing 9 cellular markers of aging (Picca et al., 2017; Carmona & Michan, 2016; Kenyon, 2011; Longo et al., 2015; Lopez-Otin et al., 2013; Lopez-Lluch & Navas, 2016). The goal of extended longevity in Western societies shifts to that of healthy aging, plus a longer lifespan, called “healthspan” (Passarino et al., 2016). The aging process is plastic, being accelerated or attenuated by many genetic and epigenetic (dietary) interventions (Kenyon, 2011). CR represents a nutrient-dense, well-balanced diet, with a reduction of caloric input by 20-40% without malnutrition. CR extends lifespan in rodents, and prevents some age-related diseases (obesity, type 2 diabetes, neurodegeneration, cardiomyopathy, cancer) (Most et al., 2017). Human studies in the area are rather limited and the benefits are not yet known. The “hormesis hypothesis” of CR suggests that the adaptive responses of cells and organs (induced by moderate stress) prevent worse damage caused by stronger similar stress (Mattson et al., 2017; Rattan, 2008; Testa et al., 2014; Horne et al., 2015; Anton et al., 2018).

The major question is whether the cause of extended longevity is due to daily caloric restriction (Most et al., 2017) or to protein intake restriction (Speakman et al., 2016). The positive effect of CR on human longevity was observed in the Kyushu Island, in the Okinawan population where the increased life expectancy was attributed to caloric restriction (Wilcox & Wilcox, 2014). This effect could be explained by neuroendocrine system modulation, hormetic stress response, increased systemic production of neurotrophic factors, reduced mitochondrial oxidative stress, decreased pro-inflammatory cytokine production and insulin resistance, decreased aging-associated signal and autophagy promotion (Moro et al., 2016; Mattson, 2017; Desgorces et al., 2016).

Short-term CR (10 weeks, 20% CR) tends to reduce the resting metabolic rate per kg of fat-free mass, systolic and diastolic blood pressure (Nicoll Rachel & Henein, 2018), glucose concentration (Velthuis-te et al., 1995), total cholesterol, LDL cholesterol, triglycerides, C-reactive protein, tumor necrosis factor (TNF-alpha), insulin concentration, and to increase HDL cholesterol (Ravussin et al., 2015), insulin sensitivity (Larson-Meyer et al., 2006; Fontana & Partridge, 2015; Omodei & Fontana, 2011; Most et al., 2017). Short-term CR also promotes mitochondrial biogenesis in skeletal muscles. Long-term CR with optimal nutrition (CRON) means that caloric intake is restricted for an average of 15 years and the person consumes about 30% fewer calories than another one fed with a regular Western diet. This kind of diet decreases metabolic and hormonal...
risk factors for type 2 diabetes, cardiovascular diseases, stroke, cancer, vascular dementia (Fontana & Partridge, 2015; Maughan et al., 2012). CR has a positive effect on DNA repair and telomere machinery, promoting genomic stability and healthy longevity (Vera et al., 2013).

* Fighting depression and anxiety. During short fasting, the human body releases ghrelin, a hormone associated with an elevated mood (Zhang et al., 2015).

* Improved gut health. Fasting refreshes the gut microbiome and improves digestion, reducing gas, diarrhea or bloating (Sutton et al., 2018).

* Effects on performance and muscle strength. Although IF increases the growth hormone, which enhances lean body mass, it does not improve strength, and may even reduce exercise capacity (Moro et al., 2016). Early studies on this topic seem to indicate that IF might be an aid in rapid post-exercise recovery. Endurance training in a fasted state can facilitate more rapid re-activation of muscle protein translation (protein kinase levels indicating muscle growth doubled compared to those during training in a fed state) (Jaleel et al., 2013). Also, endurance training in a fasted state increases the capacity for fat oxidation in the trained muscle (Burke & Kiens, 2006), but feeding before, during and after each training session might have other potential benefits (Hawley et al., 2007).

Potential side effects and risks

Intermittent fasting works well for some people and turn into a disaster for others depending on a number of lifestyle factors (Patterson & Sears, 2017). Hunger is seldom intense, at least during the adjustment stage, and the risk to develop binge eating behavior is possible.

- Headache. Some extra salt or mineral water might alleviate headache (Danielsson et al., 2019).
- Mental and physical tiredness/exhaustion, especially in morning exercisers (when exercising on an empty stomach), due to modest hypoglycemia (Grajower & Horne, 2019).
- Risk of hypoglycemia in patients with thyroid disease: weakness, dizziness, nausea, shakiness, irritability, blurred vision, sweating, paleness (Rothschild et al., 2014).
- Inability to focus, frustration
- Excessive eating during the 8-hour eating window (during fasting, appetite hormones and the hunger center are drifting, and hence fasters eat more; it is in the human nature to crave for a reward after an intense workout or exercise, so plunging into unhealthy eating behavior is possible) (Schiavo-Cardozo et al., 2013; Crispim et al., 2011).
- Negative effect on female fertility. In animal studies, 2 weeks of IF in female rats stopped the menstrual cycle (while their ovaries shrank); in male rats, it resulted in lower testosterone production. In athletic women with a low body fat percentage, IF might increase the risk of irregular menses, and lower the chance of conception (He et al., 2019). Lean women are more susceptible to neuroendocrine dysfunction, anovulation and a lengthened follicular phase compared to normal weight females (Alvero, 1998; He et al., 2019).
- Constipation
- Fasting diets are rigid and rule-based

- IF is a good strategy for cutting mindless late-night snacking, but it can also work against mindful eating habits (when simply eating by the clock).

Extra concerns of IF in athletes

- Female athletes have a high level of hepcidin (a hormone that regulates iron absorption: high hepcidin levels inhibit iron absorption, possibly due to inflammation). During intensive training sessions, females have a high level of hepcidin, and therefore they have an increased risk for anemia. The best window of opportunity for peak iron absorption is in the morning, when hepcidin is lowest. IF most frequently means skipping breakfast, and could increase the risk for anemia (Pakkir Maideen et al., 2017).
- IF could reduce testosterone. Testosterone is important for muscle synthesis, performance, strength, and general vitality. During the fasting window, a drop in testosterone was observed, especially in male subjects (Peos et al., 2019).
- Since fasting is associated with a variable calorie restriction, it could be difficult for athletes to cover their calorie intake through a 4 or 8 hours eating window (Moro et al., 2016; Tinsley et al., 2017; Levy & Chu, 2019). It is indicated to consume a meal within 2 hours after a competition in order to restore glycogen deposits (Burke et al., 2017).

Contraindications of IF

For professional athletes training twice a day or more, 16+ hours of fasting might not be a good idea.

The other contraindications to adopting such a type of diet are (Stockman et al., 2018):
- Diabetes (IF is beneficial in diabetes prevention, not for patients with diabetes or other metabolic diseases).
- People on medication for blood pressure or cardiovascular diseases (they are prone to electrolytic anomalies), and those under treatments requiring food (Danielsson et al., 2019).
- Eating disorders
- Depression and anxiety (depression is relieved in short-term, not in long-term calorie restriction).
- Pregnancy, breastfeeding, and women trying to conceive
- Low blood pressure (IF decreases blood pressure)
- Underweight
- Older adults (fasting can have negative effects on their immune system)
- Subjects under 18 years of age (children and teenagers)
- Uncontrolled migraines
- Subjects undergoing blood transfusion

Conclusions

1. The newest diet trend in the last decades is intermittent fasting, adopted by numerous athletes, celebrities and average people. Part of the fascination with intermittent fasting arises from research on animals showing that fasting may reduce cancer risk and slow aging.
2. Intermittent fasting means eating within a certain window and fasting the rest of the time (hours/days).
3. Although fasting between dinner and breakfast the next day (12 to 14 hours) could be considered a part of normal life and might have numerous positive effects, there are many disadvantages.

4. There are many short-term or long-term/extended-term fasting protocols. Competing in endurance sports (which demand a quicker way to obtain the energy, e.g. from digesting food) during fasting is contraindicated. Some sports could be more affected than others, and partial or total fast may be challenging for athletes, who need to develop effective and appropriate coping strategies to adapt.

5. Endurance training in a fasted state could have some metabolic advantages, but feeding before, during and after each training session might have other potential benefits.

6. Many athletes need a morning meal; the results are better when eating before training. For athletes, there are other safe, healthy and less extreme ways to lose weight.

Conflict of interest
Nothing to declare

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Valeria Laza.
Intermittent fasting in athletes: PROs and CONs


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Websites
Exercise and sporting activity during pregnancy. Evidence-based guidelines
Editor: Rita Santos-Rocha
Publisher: Springer, 2019
345 pages; price: €135.19 (paper) /€106.99 (eBook)

It is clearly well documented that exercise and a healthy lifestyle are crucial for both pregnant and postpartum women, and fetus and child health and development. So, in addition to improved fitness, the most evident and positive benefits for the mother are prevention of excessive weight and fat gain, and also of diabetes, hypertension and depression, while from the perspective of the fetus and child, having an appropriate weight at birth seems to represent a very relevant target and a much wanted advantage.

However, even if these benefits are well known and there is no doubt that physical activity should be a mandatory component of a healthy lifestyle, the percent of pregnant women regularly performing appropriate exercise and sport is far from being sufficient. One explanation for this unsatisfactory status could be the fact that healthcare providers do not insistently recommend and stimulate pregnant women to practice sport and exercise, whereas some fitness professionals are not sufficiently informed and prepared to design and manage adapted exercise programs in order to promote the benefits of physical activity without generating unwanted effects, such as musculoskeletal disorders, urinary incontinence, or low back pain. In other words, not all fitness instructors know “what types of exercise are the best, the safest and the most effective” in these cases.

In such circumstances, a clinical and practice oriented exhaustive book providing state of the art information to all professionals potentially involved in recommending, prescribing and supervising exercise and sport for pregnant and postpartum women is more than welcome. And the volume edited by Rita Santos-Rocha, from the Faculty of Human Kinetics within the University of Lisbon, and warmly foreworded by Dr. Michelle F. Mottola, Director of the R. Samuel McLaughlin Foundation – Exercise and Pregnancy Laboratory, Ontario, Canada, seems to be that long awaited work.

The fact that this textbook fills a gap indeed and provides the readers with evidence-based knowledge on the physiological and psychological changes occurring during pregnancy, and on the other hand with practical expertise (ideas, tools and solutions) to optimally advise and supervise the exercisers, including the most efficient points and tips for ruling out their frequently experienced fear/anxiety, is obvious just by reading its table of contents and the chapter abstracts.

So, after the authors present in the first chapter the importance of an active style and health education during different periods of pregnancy, also pointing out how important it is that health professionals promote the benefits of physical activity, the second chapter highlights the relevance of psychological, social and behavioral support, which is crucial for convincing the women to begin and/or maintain this activity. Then, the next three sections elaborate on the physiological - main adaptations and discomforts - (chapter 3), body composition (4) and biomechanical (5) changes accompanying pregnancy, as well as on their implications for physical activity.

Besides the above mentioned changes and adaptations, pregnancy can also generate significant impairments and disorders of the musculoskeletal system, which are accompanied by pain and embarrassing dysfunctions, as is the case of the relatively frequent urinary incontinence. This is why the 6th chapter comes not only with comprehensive up-to-date evidence-based information about these aspects, known as having negative effects on daily activities, but also with specific recommendations for their treatment and recovery of the functional capacity. The utility and the way in which exercise and physical activity help prevent and cure these musculoskeletal conditions and disorders will be presented in the 10th chapter.

The purpose of the three authors (coming from Poland, Portugal and Spain) of the 7th chapter was “to review the information provided in the current guidelines for exercise during pregnancy in different countries”. The resulting
overview takes into consideration both the specific pre-pregnancy habits of the subjects – inactive, active women, or competitive female athletes - and the different targeted exercise classes, whether based on aerobic, resistance, or stretching exercises. Next, chapter 8 teaches us how to correctly perform medical screening and exercise testing. The accuracy of medical screening is crucial to make sure the pregnant woman will have no risk once engaged in exercise, while the correctness of exercise testing is vital because its results help us to choose the most appropriate types and modes of exercises, their duration, frequency and intensity; these conditions are required to design effective, safe, individualized exercise programs. Even more practical than the above described chapter, the next chapter presents the ideal structure of an exercise session for pregnant women, which apart from compulsory warm-up and cool-down must contain the following four groups of exercises: aerobic, resistance plus postural plus neuromotor, flexibility, and pelvic floor muscle exercises. This chapter ends with no less than 11 examples of practical exercise programs.

Finally, the 11th chapter offers detailed nutritional recommendations, being known that energy and macronutrient intake depend on the volume and intensity of exercise, on whether the exerciser is an adult or an adolescent woman, and of course, on the moment of the day when the exercise program is performed. This means that exercisers must also be advised and taught how to properly distribute foods before, during and after exercise.

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In search of snow for the ski competitions in the mountain centers of Cluj county - 2020

In the 2019-2020 winter season that has now ended, snow was not abundant, so that the last competition scheduled to take place in Sâncraiu, was no longer held.

The other competitions took place under normal conditions, between 18 January and 16 February 2020, in the following order: Rogojel, Beliș, Râșca, Mărișel, Măguri Bogdănești, Bâișoara. Tradition develops slowly but surely. Bâișoara has the longest tradition in organizing these mountain cross-country skiing competitions, with the Little Mountain Hunters Cup as a competition in its own right. The competition was initiated in 1973, and this year its 41st edition was held.

The following year, in 1974, the first edition of the Pelagha Rosu Cup took place in Mărișel, a competition of rural mountain localities that has continued with some interruptions until the present day, reaching its 34th edition. At the first 1974 edition held in Mărișel, a cup was launched to be passed on between the participating localities, and as a general rule, it was established that this cup should remain in the possession of the team winning it 3 times consecutively. In 1989, this cup was definitively won by the cross-country skiing team of Râșca, led by Prof. Ilea Ardelean, who still participates in this circuit and can be seen in the photos of our report, alongside his colleague from Mărișel, teacher Dana Feneșan.

The cross-country skiing competitors and team of Măguri Bogdănești (Măguri Răcătău commune), situated at an altitude of over 1260 m, a mountain locality inhabited throughout the year, are in real progress, competing with Fundata commune of Brașov county, which is also situated at 1260 m altitude. The merits belong to the mayor Petru Prigoană, to the director of the Middle School, Carmen Prigoană, and to the physical education teacher Maria Toader.

Physical education teacher: Aurel Dan Crișan; Director: Prof. Mariana Pașcalău; Mayor: Gheorghe Cuc; Cluj-Napoca mountain rescue - organization and assistance

1. Rogojel Center - The Vlădeasa Cup, 8th edition, 18 January 2020

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<th>Place</th>
<th>Girls 11-12 years</th>
<th>Boys 11-12 years</th>
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Physical education teacher: Răzvan Făurică; Director: Mihaela Mocean; Mayor: Viorel Matiș; Cluj-Napoca mountain rescue - organization and assistance


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<th>Place</th>
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Physical education teacher: Răzvan Făurică; Director: Mihaela Mocean; Mayor: Viorel Matiș; Cluj-Napoca mountain rescue - organization and assistance

3. Râșca Center - The Sălănducu Cup, 22nd edition, 26 January 2020

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Physical education teacher: Ardelean Ilea; Director: Gelu Petru Săvârșan; Mayor: Teodor Petre; Cluj-Napoca mountain rescue - organization and assistance

https://doi.org/10.26659/pm3.2020.21.1.61

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4. Mărişel Center - The Pelaghia Roşu Cup, 34th edition, 1 February 2020

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Physical education teacher: Ionuţ Bal; Director: Prof. Dana Mirela Feneşan; Mayor: Viorel Ghic; Cluj-Napoca mountain rescue - organization and assistance

5. Măguri Bogdăneşti Center - The Avram Iancu Cup, 4th edition, 12 February 2020

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Physical education teacher: Maria Toader; Director: Prof. Carmen Prigoană; Mayor: Petru Prigoană; Cluj-Napoca mountain rescue - organization and assistance

6. Băişoara Center - The Little Mountain Hunters Cup, 41st edition, 16 February 2020

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Organizers: ISJ Cluj, Prof. Cristian Potora – School Inspector - physical education; Director: Prof. Lenuţa Chiş - Children’s Palace Cluj

Rogojel Center

- Arnica boarding house in Rogojel, where the members of the referee commission were accommodated.
- Waiting for the award ceremony.
- Mayor Gheorghe Cuă awarding prizes to the team leading teachers.

Beliş Center

- Award ceremony for 11-12-year-old girls, conducted by School Inspector Laura Ionescu.
- Special prizes awarded to the youngest participants in the competition. Award ceremony conducted by the director of the Avram Iancu Middle School, Mihaela Mocean. Physical education teacher Răzvan Făurică – left and Dumitră Stamate, a member of the referee commission, are also in the picture.
Râșca Center

The director of Mărișel School, Dana Feneșan, in Râșca in 2020, holding the first cup put at stake in 1974 by predecessors.

Mărișel Center

Opening of the award ceremony by the director of the Pelaghia Roșu Middle School, Dana Fenesan.

Măguri Bogdănești Center

The most difficult route of all the organized competitions, with a very difficult to climb slope.

Băișoara Center

Group picture with all participants in the Little Mountain Hunters Cup, Băișoara.

Events

Laura Ionescu
lauraionescu2005@yahoo.com
Cristian Potoră
cristianpotora@gmail.com
PORTRAITS – Personalities of Romanian science and culture

Petru Derevenco - the man and his work

Călin Gabriel Şarlă¹, Daniela Ciobanu²
¹“Vasile Goldis” Western University, Arad
²University of Medicine and Pharmacy, Craiova

Abstract
Romanian physiology had a lot of recovery to do in the field of characterizing the physiology of stress and the therapy of its manifestations, and Dr. Petre Derevenco managed to establish national and international relations which opened collaboration channels in the closed communism period.
Despite his distinguished and discrete personality, who preferred an internalized attitude, his work as a doctor and a researcher built the scaffolding for a public figure of national and international reference.

Keywords: Petru Derevenco, physiology, scientific research, the man, his work.

His personality

Petru Derevenco was a renowned physiologist, an exceptional figure of the scientific world, a member of the Academy of Medical Sciences and a member of four international scientific societies (Italy, Great Britain, Germany and the Republic of Moldova). He was probably among the first specialists (if not the very first) who studied and brought to the attention of Romanian scientists the notion of stress, thus managing to open a path for medical intervention to treat patients both directly and through the development of compliance.

The first thing one noticed in him was his outstanding politeness, shared and potentiated by Mrs Stela Rămboiu, his wife. A sensitive, warm and humane couple, devoid of any shadow of arrogance, they had the gift of making one feel comfortable regardless of one’s situation – difficult or triumphant.

This presentation is one of the hardest challenges because Petru Derevenco, PhD, was one of the most complex human beings. In his manuscript “Petru Derevenco – Memoir Indicators” (1) sent to Prof. Aurel Saulea (former Head of the Physiology Department of the Nicolae Testemițanu State University of Medicine and Pharmacy in Chișiținău), he characterizes himself as follows: “I was very solitary, almost autistic, I would prefer to play alone with my toy soldiers or read something from my father’s ample library, including unintelligible medical books or I would study the medicine that, in that time, medics would receive from various companies”. Then: “I am a bivalent person. The one hand, I am schizoid, sceptical, an atheist, certain of the primacy of science, proven by my adherence to the evolutionist doctrine, which was materialised by the publication of the book “Darwin and Darwinism” in 2011”. Or: “I am often willing to help the spiritually and materially under-privileged. In other circumstances, I have shown negligence and insensitivity towards my family, especially towards my mother and Vera (his first wife), being left with remorse”. Political attitude: “During Communism I was not a nonconformist and I made some concessions (becoming and rebecoming (emphasis added) a member of the RCP). At the same time, I was independent in my behaviour: in the ‘70s I joined “Amnesty International”, an organization for the protection of human rights. I used to frequent Western libraries in Bucharest that were being targeted by the Security”. And lastly: “I was always and consistently siding with the discriminated (especially gypsies and homosexuals), on whom I have...
written plenty articles. On the other side, I am sentimental, musically deaf, but passionate about musical auditions and shy around women, which has led me to many failures in the erotic department”.

Despite this otherwise somber picture, it must also be mentioned that during an informal meeting in which Mr. Derevenco and I participated, which was organized by the department of a Southern university and dedicated to establishing “The Medium and Long-Term Strategic Research Plan”, Professor Derevenco intervened very ambiguously and evasively. After the meeting, upon being asked about the meaning of the speech, he clarified: “If you understood what I said, then the matters presented are serious; if you did not understand, please forgive me, I was joking” (2).

His family

Petru Derevenco was born on the 26th of March (8th of April according to the old calendar) 1924 in Chișinău, his mother tongue being Russian, and he died on the 9th of October 2017.

His father, Leonid Nicolaevici Derevenco, born on the 6th of August 1881 in Putinești (Bessarabia), and his mother, Ana Petrovna Alexandrovski Derevenco, born on the 22nd of September 1886 in Chișinău, had met in Sankt Petersburg. Their connection led to the birth of his older sister - Olga - born in Livni (Ukraine) in 1919, who died hit by a car on the pedestrian crossing in 1992.

Leonid Nicolaevici Derevenco began his medical studies in Kazan (the capital of the Republic of Tatarstan, the Russian Federation). Due to the fact that he had joined an anti-tsarist socialist circle, he had to leave for Switzerland, where he studied and graduated from the Zürich Faculty of Medicine. He returned to Bessarabia in 1909, where he first became a countryside doctor. Although he had socialist convictions, a few years later he arrived in Sankt Petersburg, with the recommendation of his older brother Vladimir Nicolaevici Derevenco, who was the personal doctor of Tsarevich Alexei, who had haemophilia.

In 1949, Petru Derevenco married Vera Kohn, who died on the 2nd of December 1972 - “a terrible shock to me” (2). He met her during a training program as a posted worker at the Institute of Hygiene in Cluj, at the Physiology Department of the Faculty of Medicine in Cluj, led by Grigore Alexandru Benetato (Grigore Alexandru Benetato was born on the 18th of November 1905 in Ialoveni and he attended the “Alexandru Donici” high school in Chișinău. He pursued higher education at the Faculty of Medicine in Cluj and in 1929 he got his PhD in Medicine and Surgery).

After being released from the camp, in 1958, she got her PhD in physiology with the thesis “The role of the CNS in the process of gluoregulation”, led by Prof. Grigore Benetato MD. Then she became a consultant doctor of functional medicine in the Nuclear Medicine Department, a field where she worked and published. Her research focused on the isotope exploration of the blood flow, the thyroid and liver and on the treatment of different illnesses.

This marriage led to the birth of twins Nadia and Andrei Derevenco on the 21st of December 1950.

Nadia Derevenco emigrated to Israel in 1976 and, a few months later, after a short stay in Paris, to the USA. There, Nadia married Greg Gorman, an American citizen, a well-known artist, who created stained glass. Now they live in Lyme Center, New Hampshire. Before emigrating, Nadia graduated from the Faculty of Chemistry in Cluj and worked in a state-of-the-art biochemistry laboratory. The Gormans have a son, Alex, who, after serious study, became a police officer.

Andrei Derevenco and his wife, Maria Dimitriu, a psychologist, emigrated to New York. With the support of his family, he managed to graduate from the Faculty of Business Administration. He was successful in his work, becoming a financial counselor for some prestigious banks.

In 1980, after the death of his first wife, Vera Kon, in 1972, Mr. Derevenco remarried to Stela Râmboiu, a Doctor of Science in Radiation Hygiene.

Stela has two daughters, Corina Cîrstea, with a PhD in Informatics at Oxford, who now teaches at Southampton University in the United Kingdom of Great Britain, and Ramona Covington – adopted, who is a research doctor at the Ohio State University, USA.

Studies (3)

- Doctor of Science in medical science (1970)
- Consultant doctor (functional medicine, 1962)
- PhD in Medicine, specialization in Physiology (1961)
- In the session of September 1944, he was admitted to the Faculty of Medicine in Sibiu/Cluj, from which he graduated in 1950
- He had his baccalaureate in June 1944 in Craiova, where the archive of the A. Russo High School in Chișinău had been evacuated. He ranked second out of approximately 90 candidates, with a 9.11 grade
- He attended the primary school in Chișinău, on Viilor street, then the “Alecu Russo” High School in Chișinău – nowadays the Faculty of Philology on Pușkin street.

The main landmarks of his career (3)

- He was an honorary member of the Academy of Medical Sciences (since 1995)
- He worked in institutes of the Academy and the Ministry of Health as a scientific researcher/main researcher - 1986-1987: The role of stress in the aetiology of illnesses: the Academy of Medical Sciences, Romania, project leader: Dr. P. Derevenco
- He was a professor at the “Avram Iancu” University in Cluj-Napoca (1996-2007)
- He attended specialization and documentation programs in Italy, Czech Republic and USA and had a scholarship at the Deutscher Akademischer Austauschdienst (1972).
- He contributed works to congresses in England, Hungary, the USSR, Germany.
- He was a specialty reviewer of the magazine “Berichte über die gesamte Physiologie” by Deutsche Pharmakologische Gesellschaft; Deutsche Physiologische Gesellschaft.
- At the beginning of his activity, he had didactic functions for 6 years (tutor and assistant at the Institute of Medicine and Pharmacy in Cluj).
Scientific fields of interest

- Psychoneuroendocrine physiology, stressology, exertion and sports, ergonomics, psychosomatics.
- He continued his publishing activity and was involved in the editing of the Cluj journal The Palestrica of the Third Millennium and sports.

Awards and distinctions

- Honorary member of the Academy of Medical Sciences (Romania, 1996)
- The “Scientific Merit” Order (1967);
- First Prize of the Ministry of Education (1963, in collaboration: I. Baciu, P. Derevenco et al. for studies on work physiology)
- The Iuliu Hâțieganu Medal (2014, “Iuliu Hâțieganu” University of Medicine and Pharmacy)

Representative work

3. “Stress in health and illness”, 1992 (co-writers I. Anghel and A. Băban), Dacia Publishing, Cluj – the first comprehensive monograph in the field ever printed in Romania: the 3000-copy printing was shortly sold out.
5. “Exertion and the Endocrine System”, 1976, Dacia Publishing, Cluj, is probably the first book dedicated to this subject.

These books have summaries and tables of contents in English.

Book chapters


Works published abroad (a selection of over 40 titles)

1. 1998, Psychophysiological and behavioural characteristics related to risks for cardiovascular diseases and to occupational stress, by P. Derevenco et al., Activitas nervosa superior (Praha), 30, 99.
5. 1971, Wirkung der akuten und der chronischen physischen Belastung sowie einiger humoraler Faktoren auf die Durchblutung von endokrinen Drusen, by P. Derevenco et al., Endokrinologie (Leipzig), 57, 297-304.
9. 1963, Modifications endocriniennes et hémodynamiques chez les jeunes sportifs by P. Derevenco et al., Medicina delo Sport (Torino), 10, 1118-1123.

Works published in Romania (selections regarding stress from a total of over 200 works)


The summaries and oral presentations performed at different scientific meetings in London, Prague, Magdeburg, Dresden, Moscow, Padova, Chișinău, Paris, Budapest since 1972 are not mentioned.

References on Petru Derevenco

References
(1) Petru Derevenco - memoir indicators - manuscript
(2) Friendly discussions (sometimes registered, other times an opportunity to meditate and reflect)
(3) Petru Derevenco - Curriculum Vitae
FOR THE ATTENTION OF CONTRIBUTORS

The subject of the journal

The journal has a multidisciplinary nature oriented toward biomedical, health, exercise, social sciences fields, applicable in activities of physical training and sport, so that the dealt subjects and the authors belong to several disciplines in these fields. The main sections are: “Original studies” and “Reviews”.

Regarding “Reviews”, the main subjects that are presented are: oxidative stress in physical effort; mental training; psychoneuroendocrinology of sport effort; physical culture in the practice of family doctors; extreme sports and risks; emotional determinants of performance; recovery of patients with spinal column disorders; stress syndromes and psychosomatics; Olympic education, legal aspects of sport; physical effort in the elderly; psychomotority disorders; high altitude sports training; fitness; biomechanics of movements; EUROFIT tests and other evaluation methods of physical effort; adverse reactions of physical effort; sport endocrinology; depression in sportsmen/women; classical and genetic drug usage; Olympic Games, etc.

Among articles devoted to original studies and research, we are particularly interested in the following: methodology in physical education and sport; influence of some ions on effort capacity; psychological profiles of students regarding physical education; methodology in sport gymnastics; selection of performance sportmen.

Other articles approach particular subjects regarding different sports: swimming, rhythmic and artistic gymnastics, handball, volleyball, basketball, athletics, ski, football, field and table tennis, wrestling, sumo.

The authors of the two sections are doctors, professors and educators from university and pre-university education, trainers, scientific researchers etc.

Other sections of the journal are: the editorial, editorial news, reviews of the latest books in the field and others that are rarely presented (inventions and innovations, university and pre-university programs, forum, memories, competition calendar, portraits, scientific events).

We highlight the section “The memory of the photographic eye”, where photos, some of which extremely rare, of sportmen in the past and present are presented.

Articles signed by authors from the Republic of Moldova regarding the organization of sport education, the variability of cardiac rhythm, the stages of effort adaptability, and articles by some authors from France, Portugal, Canada must also be mentioned.

The main objective of the journal is highlighting the results of research activities, as well as the permanent and actual dissemination of information for specialists in the field. The journal assumes an important role in the achievement of necessary scores by the teaching staff in university and pre-university education, as well as by doctors in the medical network (through recognition of the journal by the Romanian College of Physicians), regarding didactic and professional promotion.

Another merit of the journal is the obligatory publication of the table of contents and a summary in English for all articles. Frequently, articles are published in extenso in a language of international circulation (English, French).

The journal is published quarterly and papers are accepted for publication in Romanian and English. The journal is sent by e-mail or on a floppy disk (or CD-ROM) and printed, by mail to the address of the editorial staff. The works of contributors that are resident abroad and of Romanian authors must be mailed to the editorial staff to the following address:

Health, Sports & Rehabilitation Medicine
Chief Editor: Prof. Dr. Traian Bocu
E-mail address: hesrehab@gmail.com; traian_bocu@yahoo.com
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Objectives

Our intention is that the journal continues to be a route to highlight the research results of its contributors, especially by stimulating their participation in project competitions. Articles that are published in this journal are considered as part of the process of promotion in one’s university career (accreditation that is obtained after consultation with the National Council for Attestation of University Titles and Diplomas).

We also intend to encourage the publication of studies and research that include relevant original elements, especially by young people. All articles must bring a minimum of personal contribution (theoretical or practical), that will be highlighted in the article.

In the future, we propose to fulfill criteria that would allow the promotion of the journal to superior levels according international recognition.

THE STRUCTURE AND SUBMISSION OF ARTICLES

The manuscript must be prepared according to the stipulations of the International Committee of Medical Journal Editors (http://www.icmjee.org).

The number of words for the electronic format:
– 4000 words for original articles;
The authors must mention all possible conflicts of interest including financial and other types. If you are sure that there is no conflict of interest, we ask you to mention this. The financing sources should also be mentioned in your work.

Acknowledgements

The specifications must concern only people outside the study who have had a substantial contribution, such as statistical processing or review of the text in English. The authors have the responsibility to obtain the written permission from

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- 2000 words for case studies;
- 5000-6000 words for review articles.

**Format of the page:** edited in WORD format, A4. Printed pages of the article will be numbered successively from 1 to the final page.

**Font:** Times New Roman, size 11 pt.; it should be edited on a full page, with diacritical marks, double spaced, with equal margins of 2 cm.

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- The tables should be numbered consecutively in the text, with Roman numerals, and sent as distinct files, accompanied by a legend that will be placed above the table.

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   - **Background.** Description of the importance of the study and explanation of premises and research objectives.
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In the final stage, all materials will be closely reviewed by at least two competent referees in the field (professors and docent doctors) so as to correspond in content and form to the requirements of an international journal. After this stage, the materials will be sent to the journal’s referees, according to their profiles. After receiving the observations from the referees, the editorial staff shall inform the authors of the necessary corrections and publishing requirements of the journal. This process (from receiving the article to transmitting the observations) should last about 4 weeks. The author will be informed if the article has been accepted for publication or not. If it is accepted, a period of correction by the author will follow, in order to meet the publishing requirements.

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