CONTENT

The use of physiotherapy in post-traumatic temporomandibular joint healing. A clinical case
Roxana BORDEA, Ondine LUCACIU, Florin ONIŞOR, Bogdan CRIŞAN,
Radu Septimiu CÂMPIAN.........................................................................................5

Family’s perception concerning young pupils’ physical education
Gabriela DINŢICĂ........................................................................................................9

The optimization of physical training in table tennis beginners
Marian DRAGOMIR, Laurenţiu LICĂ, Germina COSMA........................................14

Study regarding the solicitation level of the exercises used for landings training in artistic gymnastics
Ana-Maria GAVOJDEA................................................................................................18

Aspects of the relation between sport activities and fitness elements in youngsters with down syndrome
Valeria BĂLAN, Katharina KISS..................................................................................22

Basic principles of kinetic programs
Erwah ALNABLSI........................................................................................................28

Mathematical modeling of the sport phenomenon and correlation between anthropometric parameters and cardiac endurance in athletes juniors
Carmen Liliana GHERGHEL, Virgil TEODORESCU, Sorin PRICOPE..........................31

A comparative analysis between the concepts of public relations and marketing in sport
Alina ABABEI, Vasilea GRIGORE..............................................................................36

The influence of the affected side in the improvement of the static and dynamic balance in post stroke hemiplegic patients
Gabriela-Adriana MARINESCU, Mariana CORDUN................................................41

The effects of psychotherapy in guided recovery in basketball
Anca Dana POPESCU, Ruxandra Mirela EL-BSAT....................................................48

Study on the improvement of explosive strength in children aged 10-11 years using the jump training
Camelia BRANET........................................................................................................55

Modern methods of functional rehabilitation after ischemic-type stroke
Sergiu MITROI, Mariana CORDUN...........................................................................58

Mobility dependence of children from 1st to 4th grade in Portuguese schools
Samuel HONÓRIO, Marco BATISTA, Júlio MARTINS, João SERRANO, António
FAUSTINO, Helena MESQUITA.................................................................................62

Identifying the intrapersonal communication barriers in the alpine ski and eliminating them through specific methods and resources
Valentin CARACĂŞ, Iozsef Laszlo HIDI, Dumitru VASILESCU, Daniel PISIĆĂ...........66
Factors that influence the functional recovery of the knee and return to sport after anterior cruciate ligament reconstruction to performance sportsmen
Ion Bogdan CODOREAN, Horea CODOREAN, Viorel COJOCARU...............................72

Biomechanical aspects on uppercut punch
Irina BĂIŢEL, Dan DELIU......................................................................................79

Musculoskeletal disorders etiology and incidence among dentists in Craiova
Adina Magdalena STANCIU, Ilona ILINCA, Eugenia ROSULESCU, Constantin DAGUCI, Germina COSMA..............................................................................85

Methodological contributions concerning the impulse power development in terms of mobility
Liliana MIHĂILESCU, Ilie MIHAI, Gabriel TUDORACHE........................................91

Study on ascertaining the report of emotionality versus rationality in the handballgame
Dragoş Ioan TOHĂNEAN, Ioan TURCU.................................................................96

The characteristics specific to the high performance male volleyball
Laurentiu LICĂ, Liliana MIHĂILESCU ......................................................................100

Functional rehabilitation of the knee joint after arthroscopic anterior cruciate ligament reconstruction to the football players. the preoperator stage
Horea CODOREAN, Ion Bogdan CODOREAN, Viorel COJOCARU..........................105

Social impact by organizing sports events
Emilia Carmen TOCALĂ......................................................................................110

The future of sport law in Romania
Florentina-Camelia MEDEI..................................................................................116
THE USE OF PHYSIOTHERAPY IN POST-TRAUMATIC TEMPOROMANDIBULAR JOINT HEALING. A CLINICAL CASE

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Abstract. Using laser energy in different areas of medicine and sport to rehabilitate both athletes and people who practice sport is a topic of interest to specialists. With the use of medical lasers since the 1960s, numerous therapeutic procedures utilizing this form of energy have been described. In recent years, the use of laser biostimulation associated with kinesiotherapy for the recovery of post-traumatic injuries in the oromaxillofacial area has gained increasing ground. Low level laser therapy (LLLT) is used to biostimulate healing of the traumatized temporomandibular joint. The international literature describes numerous ways of using low level laser therapy (LLLT) in patients with TMJ trauma following sports activities. This article illustrates through a clinical case the treatment of a traumatic sports temporomandibular joint injury. The case was documented regarding pre- and postoperative clinical signs, postoperative evolution and patient comfort related to laser biostimulation and kinesiotherapy procedures. Considering the objective criteria and their analysis, the results are favorable. The combination of the two methods was validated as a reliable method to improve patient comfort during and after various procedures; due to its advantages, recovery and healing time was reduced.

Keywords: trauma, kinesiotherapy, laser therapy, recovery.

Introduction

The facial area is one of the most exposed to trauma. The mandible is the facial bone with the highest rate of fractures from all facial bones because of its anatomical architecture, position and prominence. Mandibular fractures have a high rate of incidence, reported between 36%-59% of all types of fractures that occur in the maxillofacial area (Bereket et al., 2015).

Mandibular fractures can be unilateral or bilateral, they can involve the body of the mandible and the condyle. Of all mandibular fractures, condylar fractures are very difficult to diagnose because of the anatomical configuration of the mandible (Yonezu et al., 2009).

Among the studied populations, the pattern and the etiology of mandibular fractures vary. The etiology of fractures is a very hot topic that appears in many studies; nowadays, a great increase of sports injuries is witnessed (Barde et al., 2014).

The functional treatment of mandibular condylar fractures is very important because the recovery of the movement and motor function of the TMJ is essential (Panagopoulos, 2011).

The following case presentation exemplifies the functional treatment of a low right subcondylar fracture caused by a sports trauma. The patient gave his informed consent for this publication.

Materials and methods

Case presentation. A 29-year-old male patient was referred to our clinic for an alteration of his right facial side due to a swelling located in the right chin area. The swelling was covered with abraded skin. The patient reported that he had suffered a trauma while playing football. The trauma occurred 1 hour before he came to our clinic.

Clinical and paraclinical findings

The clinical examination of the patient indicated positive Lebourge. The patient presented a limited mouth opening of about 3 cm and pain in the right temporomandibular joint. When the patient was asked to close his mouth, a latero-deviation to the left was observed. Trigeminal points were painless spontaneously and after palpation. No lymph nodes were identified. Given the clinical signs, we suspected a subcondylar fracture. For diagnostic confirmation, we indicated CT evaluation.
Results

Diagnostic focus and assessment

Based on clinical and paraclinical (CT scan) evaluation, we concluded that the diagnosis was maxillofacial trauma with low right subcondylar fracture and partial displacement, right parietal and epicranial hematoma and right shoulder contusion due to a sports injury (football).

The CT scan described no intra- or extra-axial brain bleeding, no heterodense spontaneously visible lesions at infratentorial and supratentorial level. The structures of the midline in normal position and the ventricular system within the normal range. No fracture lines visible in the neurocranium. Full fracture with minimal displacement of the mandibular ramus on the right. The patient also presented bilateral maxillary sinusitis, without lines or vertebral compression fracture to the neck, preserved vertebral alignment and spinal canal.

The conclusion of the CT investigation was full fracture with minimal displacement of the mandibular ramus on the right (Fig. 1, 2, 3).

![Fig. 1. Transverse CT scan indicating the fracture line at the level of the right mandibular ramus](image1)

![Fig. 2. Sagittal CT scan indicating the fracture line at the level of the right mandibular ramus](image2)
Therapeutic focus

The initial treatment protocol was a multimodal approach, designed to treat the fracture. Because the fracture was with minimal displacement, the muscles kept the fragments in the correct position, so we performed a close reduction of the mandibular fracture. A maxillary and a mandibular splint were fixed with circumdental ligatures on all teeth. We performed an elastic intermaxillary block that was maintained for ten days. We inserted a wire into the maxillary, mandibular and zygomatic bone and we applied fixed attachments for the elastic intermaxillary block. After 10 days, a rigid intermaxillary block was applied and maintained for six weeks. During the intermaxillary block, the patient underwent laser treatment in order to accelerate healing. Laser treatment was performed with a low level laser BTL-10 with semiconductors (Beautyline, Ltd, Prague, Czech Republic), with a wavelength of 830 nm and a handpiece with convergent emission of radiation. We used a density of 4.0 J/cm² and frequency was 10.0 Hz. The power of the head was 50 Mw, in the infrared spectrum. We performed ten laser treatment sessions during the healing process and ten sessions in the recovery period.

After six weeks, the intermaxillary block was removed. The patient had functional difficulties in mobilizing the right temporomandibular joint. Mouth opening was limited to 3 cm and was painful. The patient underwent kinesiotherapy consisting of 10 minutes of daily exercise for two months.

The patient applied warm compresses on the right masseter muscle region. The aim of this application was to induce muscle relaxation. After achieving this objective, kinesiotherapy was conducted. The kinesiotherapy protocol included exercises that the patient was supposed to perform 6-8 times/day for 10 minutes. The exercises were performed in front of a mirror in order for the patient to follow the exercises and correct them if they were not properly executed. The patient had to practice mouth opening exercises; also, he had to perform an active mandibular propulsion and laterality movements in the direction of the side that was not fractured. Active treatment had to be carried out for two months. During the two months of kinesiotherapy, he underwent low level laser therapy sessions for 10 days every month.

We recommended the following complementary measures to conservative treatment:

- diet, which had to be semi-liquid and of reduced consistency,
- medication: analgesics or NSAIDs could be taken if necessary.

Follow-up observation continued for about 2 months. At the end of the two month period, the patient completely regained joint functionality and mouth opening was painless.

Because there was no recurrence of symptoms during the observation period, we decided to see the patient at 6 months, 1 year and 2 years.
Discussions and conclusions

The relationship between the etiology of the fracture and the force that produced the injury is dependent on the pattern and also the site of the fracture. A lot of studies have shown that among maxillofacial bones, the mandible is one of the most common bones involved in fractures occurring after sports injuries. Singh stated that of all mandibular fractures, condylar fractures are the most frequent ones, which occur after falls or sports. There are three types of condylar fractures: intracapsular crush fractures of the condylar head, high condylar fractures through the neck above the sigmoid notch, and low subcondylar fractures (Kalía et al., 2008).

Park et al. reported that the most common cause of facial fractures is fall, in a proportion of 32.05%, which causes condylar fractures and sports injuries in a proportion of 11.07% (Park et al., 2015). The incidence of mandibular fractures after sports is higher in young people, most frequently in males, according to the studies conducted by Tatsumi et al. and Gutta et al. (Tatsumi et al., 2015; Gutta et al., 2014).

In our case, the treatment of the condylar fracture was aimed at immobilizing the fractured fragments and at restoring the patient’s right temporo-mandibular joint function. By applying LLLT, we reduced post-traumatic edema and stimulated osseous callus formation. Using low level laser therapy in addition to physiotherapy helps in relieving pain and inflammation, in repairing tissues and increasing cell proliferation among different cell lines in order to obtain a faster healing process (Rizii et al., 2016; Alghamdi et al., 2012; Moore et al., 2005; Oliveira et al., 2011; Pereira et al., 2012). LLLT is well known for its effects that include acceleration of wound healing, acceleration of damaged tissue healing, stimulation of bone repair and remodeling processes, anti-inflammatory effects, reduction of tissue edema and stimulation of endorphin release (Lins et al., 2010; Walsh, 1997). Kinesiotherapy is aimed at preventing ankylosis of the temporo mandibular joint (TMJ) and at restoring the mobility of the condyle. The combination of the two methods was validated as a reliable method to improve patient comfort during and after various procedures, due to its advantages in reducing the length of recovery and healing time.

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FAMILY’S PERCEPTION CONCERNING YOUNG PUPILS’ PHYSICAL EDUCATION

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Abstract. Grade 0, or the preparatory grade, has come into force in the school year 2012-2013. Being the first year of implementation, it is necessary to perform an evaluation of the proposal and of the degree in which the objectives were met. As a result, this paper will determine in what degree parents consider that the physical education classes have an influence over their children. Research methodology. The questionnaire was applied at School nr. 59 in Bucharest, with the consent of the school’s directorate and with the help of Mrs. Constantinescu Gabriela, physical education teacher, and of teachers from the preparatory grade. In total, 75 questionnaires were applied and we received 51 answers from the parents (the confidentiality rule was applied and parents were explained that the results will only be used for scientific purposes). Results. Parents’ opinion is almost unanimously for introducing the physical education lesson in grade 0 and for the lesson being conducted by a specialized teacher. Conclusions. The introduction of physical education within the educational curricula is important. Beyond sports’ positive impact on the child’s body, effects on his or her personality structure or on the way he or she learns how to develop relationships with the colleagues can also be identified. During physical education lessons, children should learn what it means to compete, what is the spirit of competition, what winning means and what one has to do in order to win.

Keywords: school, physical education

Introduction

We know that the development of a human being is influenced by three important factors: heredity, environment and education. During child’s education, the family was and still is considered as a main and primordial factor because, according to the normal order of things, education begins within the family. The family’s contribution is more important if the child is younger and decreases while the child evolves into adulthood. The school is the main educational institution for the young generation, but a very important factor is the role of the family, which represents the first educational environment and, in the same time, the environment that determines the success of the school activities. It has been argued that the education received within the family, the initial education, has an important influence over the future development of the child’s personality (psychologists consider that the mental and affective development during the first year of life is fundamental).

Parents are the ones who are the most able to provide feedback regarding how the physical education classes are conducted, since they are the ones who are interested in the activities performed by their children. Each parent wants the best institutions and the best services for a good development of his or her children and, as a result, parents will be cooperative regarding responses related to physical education and sport activities.

The family is the oldest and most important institution in a society. “Family is a permanent social group of individuals connected through blood, origin, marriage or adoption, who share the main responsibility for the society’s members’ reproduction and development. The family represents the instrumental nucleus of the larger social structure, since all the other institutions depend of its influence” (Stanoiu & Voinea, 1983, cited in Stanciulescu, 1998, p.11).

The family is responsible for the child’s education during the first years of life, these first years being extremely important in what a person would become. The expression “the seven years at home” is known and it refers exactly to this early education, which is the most important and, as stated before, influences the route of the entire life.

We now that physical activity has many positive health outcomes including its influence on meeting healthy weight goals, when associated with low-energy intake through healthy eating habits. At children, physical activity is very important as it improves gross and fine motor aptitudes development needed for academic performance (e.g., reading, writing), self-perceived competence (academic and athletic) as well as increasing social and emotional adjustment and self-esteem. Physical activity in groups and games also has social benefits in that they offer children possibilities to learn new aptitudes while developing friendships (Zecevic et al., 2010).

DuBois (2010) considers that the lack of physical activity and poor eating patterns among youth has received a great deal of both national and world wide attention. Regular physical activity reduces the risk of dying of coronary heart disease, first leading cause of death, decreases the risk for stroke, diabetes, colon cancer and high blood pressure. In addition, physical activity helps control weight, contributes to healthy joints, muscles and bones, reduces symptoms of depression and anxiety, and is associated with improved mood and increased sense of well-being.
Regular physical activity is also associated with fewer hospitalizations and physician visits. The physical education lessons at the preparatory grade try to provide children with the first elements regarding practicing sport in an organised environment. The main activities performed during the physical education classes are games, which represent an activity beloved by all children. A game not only develops the elementary movement skills, but also develops a sense of collectivity, of orginality and, most important, of knowledge. Through a well balanced game practice, one of the tasks of education can be largely achieved, that of developing a child into an individual capable of cohabiting in harmony with other individuals and of acting in a civilized and correct manner.

During games that involve movement, the student not only gains and improves numerous basic skills related to motion, but he or she also has to apply these skills in new terrain situations. The competition, in most cases, requires greater efforts in order to solve actions, which allows the development of movement skills, of moral qualities and of will (Epuran, 1973, p. 24).

The physical education is a pedagogic process and the teacher can use his or her experience, tact and artistry, but also the initiative, independence and responsibility of students. It is known that information, character, skills and moral attitudes are developed through a long educational process. Class 0 or the preparatory class came into effect in the 2012-2013 school year. Because the preparatory class is still a new educational concept, we consider useful to find out what influence parents believe that physical education classes have on children. Physical education in preparatory class has the following objectives: maintaining state of optimal health of students and increasing the capacity of adaptation to the environment, harmonizing their physical development, the development of the basic driving and elementary sporting skills, the independent practice of the physical exercises, games and various sports and, not least, the development and manifestation of the team spirit.

Materials and methods

For the study we used: the documentation method, the graphical method and the questionnaire method. The following steps were followed in order to prepare the questionnaire:

- the delimitation of the survey theme, checking the group to whom the questionnaire is addressed and compliance of the sample with the chosen theme.
- drafting questions: selecting the format or formats of questions
- chaining questions.

The questionnaire contains 8 closed questions, where the answers are set in advance, and 2 open questions, where the respondent has the liberty of freely expressing opinion.

The objective of the paper. School and family are the main factors that can act in an organized manner on the formation of child’s personality. School takes the child at a pretty early age as he or she has been educated by the family, and then, through teachers and professors, tries to correct some of the psychosomatic deformities of the adult of tomorrow.

The purpose of the study is to learn the family's attitude to sport, physical education and what change can be made for a better performing of such activities.

Study’s participants. The questionnaire was applied at School no. 59 in Bucharest, with the consent of the school’s directorate and with the help of Mrs. Constantinescu Gabriela, physical education teacher, and of teachers from the preparatory grade. In total, 75 questionnaires were applied and we received 51 answers from the parents (the confidentiality rule was applied and parents were explained that the results will only be used for scientific purposes).

Results

At the first question “Does your child performs sporting activities outside school?” 53% of the responses were NO and 47% YES. At the question “Do you consider that the physical education class is necessary in grade 0?” the responses were: 98% - YES and 2% - NO.

The answers at the third question, regarding the usefulness of the physical education class, had the following distribution: 69% - Very good, 29% - Good, 0% - Weak, 2% - Very weak. The positive answers regarding the usefulness of the physical education class have a very high percentage, which means that the parents consider the physical education classes as having an influence over young pupils. At the question “Does the physical education
class has to be conducted by a specialized teacher?”, the percentages were: 82% of the parents responded affirmatively and 18% negatively.

We have obtained two types of answers for the question “How many classes a week do you consider that are necessary for grade 0?” This tendency is determined by the fact that 38 of the parents gave an exact number (1 hour/week – 5%, 2 hours/week – 74%, 3 hours/week – 18% and 5 hours/week – 3%), while 14 parents were undecided: 1-2 hours per week – 15%, 2-3 hours per week – 69%, 3-4 hours per week – 16%.

![Fig. 1. The number of hours weekly deemed useful for physical education](image)

At the question no. 6, “Do you agree with exemptions for the physical education class?”, the percentage of the answers is 63% - YES, 37% - NO. 88% of the parents responded affirmatively and 12% responded negatively to the question “Are you familiar with the effects of physical exercises on the children bodies at the age between 5 and 7 years old?”

At the question no. 8: “Do you wish for your child to perform a sport activity outside school?”, the responses were 96% - YES and 4% - NO. At the question no. 9: “What sport activity do you want your child to perform outside school?”, the responses were different, some of the parents wishing for their children to perform several sports. The distribution of answers was as follows: swimming – 57%, tennis – 12%, dancing – 11%, karate, basketball, gymnastics – 8%, football, ballet – 6%, volleyball, athletics, fencing – 4%, skating, chess – 2%.

![Fig.2. Distribution of sports activities chosen by the parents](image)

At the question no. 10, “Do you agree with introducing more physical education classes at grade 0, at the detriment of other classes?” has received the following distribution of responses: 65% - NO, 35% - YES.

**Discussions and conclusions**

The sport class within the school curriculum is of great importance! Beyond the effects of sport on the body of the child, there are effects on his personality structure, on the model in which he learns to structure the relationships with his colleagues. During classes of physical education, children should learn what the competition means, its spirit, what it means to win and what you have to do in order to win. What it means to work in a team and how can you assume responsibilities within a team, depending on what you know and can you really do.
During the education of the child, the family is considered to be an essential and primordial factor because education begins in the family. Here, the child makes his preparation for life, the family’s contribution being all the greater as the baby is smaller, and decreases in the growth stages of ontogeny. The family offers the child superior behavioral and communication models, contributing tellingly at the child’s socialization, at the development of his conscience and moral behaviors. Precisely because of these things I have considered the parents’ permission regarding the physical education class as being important.

From the questionnaire above and mathematical interpretation of the results, we believe we can extract some conclusions.

Although the number of children who practice sport outside of school is higher, the difference is not encouraging. 47% of responses were negative, a relatively high number in our opinion. This may be caused by parents not having the time to drive them in a sport, or do not have the financial possibilities. However, the answer to question 10, which shows that every parent wants his child to practice at least one sport in the future, is encouraging.

The parents’ opinions regarding the need to introduce physical education class to grade 0 is almost unanimously as necessary, as well as the agreement regarding its management by a specialized teacher. Parents’ indecision arises when asked how many hours of physical education they believe would be required per week. The highest percentage was obtained by the opinion that 2-3 hours/week are necessary. This response comes in conjunction with answers provided to question no. 7, through which we have shown that most parents knew the effects of practicing physical exercise at this age. Regarding granting medical exemptions, it seems that parents have some reserves to keep this rule. We think it would be helpful for the parents to cooperate more closely with the physical education teacher and doctor of the institution, who can provide information on age peculiarities of children, the importance of practicing physical exercises, the important role of the environment in children interaction, the insurance of protection and physical security of children.

The sport that was preferred by parents for the child as a future activity was swimming, followed by tennis, dance, karate, basketball, gymnastics, football, ballet, volleyball, athletics, fencing, skating, chess. Here we consider as being useful the intervention of the physical education teacher, who can explain and guide parents towards certain sports, depending on the abilities of every child. Also, we believe that all teachers should explain the necessity of the daily driving activities of children, because, as observed, parents do not consider useful to introduce several hours of physical education at the expense of other school classes. Regarding the introduction of several hours of physical education in grade 0, to the detriment of other subjects, responses were more negative than positive, showing the parents’ desire to keep the same curriculum for the pre-school class.

Research suggests that there is a connection between parental physical activity, encouragement, involvement/interaction, support, and their children’s physical activity. Moore et al. found that children between 4 and 7 years of age were 3.5 to almost 6 times more likely to be active when one or both parents were active. Among the various parts of parental influence, it appears that parental facilitation exerts the greatest independent influence on young children’s physical activity. There is evidence that parental support of child physical activity contributes to the maintenance of physical activity habits later in adolescence (Zecevic et al, 2010).

Physical activity is a complex, multi-dimensional behavior influenced by a wide range of factors (often referred to as correlates) operating at individual, social, family and environmental levels. A summary of the various factors affecting participation in physical activity in children and young people is included below. Factors affecting participation in physical activity (BHF National Centre, 2014) are:

- **Age:** Children are more active than young people. The decline in activity appears most markedly in late childhood (around ten years of age) and early adolescence, particularly for girls.

- **Gender:** In almost all countries for which records exist, boys are more active than girls.

- **Demographic factors**

  - **Socio-economic status:** Adolescents from higher socio-economic groups tend to be more physically active than those from lower socio-economic groups, with around a 10% difference between low and high affluence households.

  - **Education:** Lower levels of educational attainment are associated with lower levels of physical activity participation in school-aged children and a greater decline in participation through adolescence

  - **The psychological factors** that positively affect participation in physical activity include: being involved in the selection and planning of physical activity; an interest and belief in the values of physical activity; feelings of competence, success and achievement for adolescents; a positive attitude towards physical activity and enjoyment of physical activity, particularly for girls; belief in one’s ability to be physically active (self-efficacy); activities
are enjoyable, developmentally appropriate and are consistent with personal goals and lifestyle; opportunities to challenge oneself, set goals and to improve.

The psychological barriers to taking part in physical activity include: perceived lack of time, lack of interest, the effort required, other activities, issues of body image and appearance in adolescent girls.

Physical activity participation is affected (positively and negatively) by the social support and role models provided by significant others. For children and adolescents these significant others include: family and caregivers, peers, friends, teachers, health professionals, exercise professionals including coaches and physical activity instructors.

The US National Association for Sport and Physical Education makes several recommendations on the website kidshealth.org for parents who have children aged between 6 and 12:

- To develop harmoniously, every child should carry at least one hour of physical activity every day and should not be allowed to remain inactive for more than two hours.
- Parents should be able to introduce various physical activities in the child's routine. These activities may even be housework to stimulate the child to leave the computer, such as descending the stairs to take out the garbage, or simply performing an evening stroll.
- Participation in team sports helps children not only physically, but also psychologically or morally. This way, they learn to be disciplined, to comply with various rules, to collaborate with others to achieve a goal.
- Children who love sport with passion from young ages remain with this passion throughout life. As a result, it is desirable to ensure that they become healthy adults, vigorous, energetic and protected as much as possible against the risk of getting sick prematurely from all sorts of diseases associated with sedentary lifestyle and obesity.

We believe that parental involvement in children's school activities is beneficial in the sense that they should have a good cooperation with teachers, in our case especially with the physical education teacher. The latter we believe can guide parents toward extracurricular sports activities which would be suitable for children. Also, permanent collaboration between the physical education teacher and school sports clubs is required for channeling the children to them. It can be seen that many parents want their children to practice at least one sport, but it is possible that they may not really know the possibilities of the child. Here comes the role of physical education teachers to guide students toward sports where their qualities are fitted.

In the future, we plan to continue this study to see if after a period of 2-3 years the number of children outside school sport classes is higher or not and whether physical education classes have had a positive impact or not.

References


THE OPTIMIZATION OF PHYSICAL TRAINING IN TABLE TENNIS BEGINNERS

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Abstract. Introduction: The fundamental feature of the game of table tennis in terms of performance is given by the dynamism of play phases, superior physical training, speed of thought and action, precision, met in the context of a total offensive game when the speed of the ball reached unsuspected performance. Aim: The aim of the research was to prepare and validate a new program of training for juniors in order to achieve growth movement parameters of athletes. Methods: In the working program both specific and non-specific means were introduced. The athletes (n=14) were tested before and at the end (after 6 months), aiming to develop the speed, endurance, strength in the upper limbs, lower limbs and the abdomen. Results: The proposed program has proven its efficiency, the participants achieving superior results in most tests performed during this research. Conclusion: The research outlines the importance of the reorientation of physical training methodology and content in table tennis so that it becomes the basic component in the development of technical and tactical arsenal of the game.

Keywords: table tennis, physical training, beginners.

Introduction

The sports training of perspective, performed with continuity and directed gradually on upward levels and phases in accordance with specific concepts of sport science and physical education, with the table tennis sports and age peculiarities, became an objective necessity and a condition of performance. The complexity of sports training, taking into account the particularities of sport, the individual and age characteristics requires both knowledge and concern for professional scientific research.

Table tennis is an accessible, sport branch practiced at all ages and all over the world, which requires a high-speed responsiveness and execution, mental strength and good physical training from those who want to make a performance sport from it.

The issue of physical training of children and juniors toward sport performance has been a permanent concern with the specialists in physical education and sport, this issue being addressed in the literature, the specialists concerns being thus materialized in works which synthesize and summarize the knowledge, concepts and visions on issues of physical training in sport training (Colibaba-Eulet & Bota, 1998, p. 99; Teodorescu, 2006, p. 148; Kibler, McQueen & Uhl, 1988).

The physical training is a key component of sports training in any sporting discipline and at every performance level. The role of physical training was considered significant in recent years in many sports, especially in the team sports area, including the table tennis. Physical training relates to the development of physical possibilities of the individual, the effort characteristics to table tennis competition is a level to be achieved by repeating the systematic exercise to develop motor skills in specific manifestations. The development of motor skills implicitly assumes higher morpho-functional indexes of body and mastery of a wide system of varied and specific motion skills. From this perspective, physical training is reflected as two main issues: general physical training and multilateral specific physical training.

Over the competition, the table tennis players need to apply several physical skills such as speed, strength, cardiovascular endurance, agility, perceptive and taking decision skills, as a consequence of the continuous and changing situations of this dynamic game (Pradas et al., 2011).

To be successful in competition and to tolerate intensive training demands, tennis players need a mixture of speed, agility and power combined with medium-to-high aerobic and anaerobic capabilities, related to whole body muscle groups (Fernandez et al., 2009).

The purpose of our scientific approach is to contribute to the optimization of the methodology process for the table tennis beginners, adapting the requirements and content of lessons to practical reality and the introduction of means-specific training in lessons, especially those from gymnastics.

Materials and methods

The research was conducted for 6 months and involved the introduction of new working programs in physical training exercises to table tennis beginners. The research subjects (n=14, male, aged 10 ± 1.5 years) participated 3 times a week to programs that had in its structure both specific and nonspecific means, particularly in the form of movement games and gymnastics. The lesson was structurated so that half of the fundamental part containtable
tennis specific means and the other half contain gymnastics specific means, including acrobatic elements like rolling, handstanding, cartwheel.

The objectives of the work program assumed the general physical training: general physical development, harmonious body and better health; the training of basic and applied motor skills; developing basic motor skills with emphasis on skill and speed.

The special physical training (training and development of specific motor skills and qualities, according to tests and control rules).

Among the means used there it can be included learning exercises and relay races, games of movement for developing the specific travel movement, speed reaction, repetition and specific skill.

Subjects were tested before and after implementing the work programs, consisting of running speed tests on 50m, standing long jump, running 600m, throwing the rounders ball, maintaining the body hanging, shuttle running drills, abdominal strength. It was requested the written consent of parents / tutors to participate in research.

The statistical analysis of the data was performed using SPSS, V.21, the significance threshold was set at $p<0.05$.

### Results

Table 1. Descriptive statistics for the initial and final tests

<table>
<thead>
<tr>
<th>Tests</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>50m running T1</td>
<td>14</td>
<td>9.80</td>
<td>10.60</td>
<td>10.07</td>
<td>0.28</td>
</tr>
<tr>
<td>50m running T2</td>
<td>14</td>
<td>9.40</td>
<td>10.30</td>
<td>9.72</td>
<td>0.25</td>
</tr>
<tr>
<td>Long jump T1</td>
<td>14</td>
<td>111.00</td>
<td>160.00</td>
<td>131.78</td>
<td>15.44</td>
</tr>
<tr>
<td>Long jump T2</td>
<td>14</td>
<td>115.00</td>
<td>162.00</td>
<td>137.28</td>
<td>16.38</td>
</tr>
<tr>
<td>Running 600m T1</td>
<td>14</td>
<td>2.30</td>
<td>3.40</td>
<td>2.67</td>
<td>0.33</td>
</tr>
<tr>
<td>Running 600m T2</td>
<td>14</td>
<td>2.30</td>
<td>3.40</td>
<td>2.66</td>
<td>0.34</td>
</tr>
<tr>
<td>Throwing the rounders ball T1</td>
<td>14</td>
<td>12.50</td>
<td>17.00</td>
<td>15.05</td>
<td>1.49</td>
</tr>
<tr>
<td>Throwing the rounders ball T2</td>
<td>14</td>
<td>14.00</td>
<td>17.50</td>
<td>15.74</td>
<td>1.32</td>
</tr>
<tr>
<td>Body hanging T1</td>
<td>14</td>
<td>43.30</td>
<td>51.15</td>
<td>48.03</td>
<td>2.82</td>
</tr>
<tr>
<td>Body hanging T2</td>
<td>14</td>
<td>45.50</td>
<td>53.15</td>
<td>50.23</td>
<td>2.73</td>
</tr>
<tr>
<td>Shutter running drills T1</td>
<td>14</td>
<td>10.04</td>
<td>13.03</td>
<td>11.32</td>
<td>1.06</td>
</tr>
<tr>
<td>Shutter running drills T2</td>
<td>14</td>
<td>9.01</td>
<td>13.04</td>
<td>10.53</td>
<td>1.34</td>
</tr>
<tr>
<td>Abdominal Strength T1</td>
<td>14</td>
<td>9.00</td>
<td>19.00</td>
<td>13.50</td>
<td>2.90</td>
</tr>
<tr>
<td>Abdominal Strength T2</td>
<td>14</td>
<td>13.00</td>
<td>22.00</td>
<td>17.35</td>
<td>2.97</td>
</tr>
</tbody>
</table>

In terms of running speed on 50m, an average of 10.07 ($\pm 0.28$ seconds) was recorded at initial testing and in the final testing, this parameter was improved to 9.72 ($\pm 0.25$ seconds).

Applying the test of significance (Table 2) a value of $t = 3.80$ is registered, which stands at a threshold of significance of 0.002 ($p < 0.05$) effectively demonstrating the work programs efficiency in terms of speed.

The long jump records, at the initial testing, values between 111 and 160 cm, with an average of 131.78 ($\pm 15.44$cm).The legs strength increases to final testing, reaching 137.28 ($\pm 16.38$cm). The mean difference is significant at a threshold of $p<0.05$, t value being $-4.34$ ($p=0.001$).

Regarding the evolution of the subjects running test on a distance of 600m, there was recorded in the first test an average of 2.67 ($\pm 0.33$minutes) and in the final testing 2.66 ($\pm 0.34$ minutes). Even if the evolution has been positive, the mean difference was not statistically significant ($p> 0.05$) regarding the 600m race.

Throwing the rounders ball recorded at initial testing values between 12.5 and 17m, an average of 15.05 ($\pm 1.49$m), increasing strength in the upper limbs to final testing up to 15.74 ($\pm 1.32$m). The mean difference is
significant at a threshold of $p < 0.05$, $t$ value is -5.92 ($p = 0.001$). It results that the likelihood of reasons other than the experimental ones is less than 0.05%, which amounts to 95% level of confidence.

The strength in the arms for the test of hanging on the fixed bar, saw in the initial testing values between 43.3 and 45.5, with a mean of 48.02 ($\pm 2.82$ seconds). The increasing strength in the upper limbs to final testing was up to 50.23 ($\pm 2.73$ seconds). Mean difference is significant at a threshold of $p < 0.05$, $t$ value is -4.32 ($p = 0.001$), thus confirming the statistical probability that the effects could arise from other causes as less than assumed a significance threshold 0.05.

The speed test by the shuttle test, recorded in the first tests an average of 11.32 ($\pm 1.06$ seconds), dropping as a consequence of their work programs up to 10.53 ($\pm 1.34$ seconds).

The $t$ test values (3.57) which means that there are more than 95% chance that the effect is the consequence of the underlying programs and not a random one.

Regarding the determined abdominal strength by lifting the torso from lying test, there was in the initial testing an average of 13.5 ($\pm 2.90$ repetitions) and the final testing, this parameter was improved to 17.35 ($\pm 2.97$ repetitions). Applying the test of significance (Table 2) is registered a value of $t = -4.88$, which stands at a threshold of significance of 0.001 ($p < 0.05$) effectively demonstrates the work programs in terms of abdominal strength.

<table>
<thead>
<tr>
<th>Table 2. Paired Samples Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paired Differences</strong></td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td><strong>Pair 1-Run.50m</strong></td>
</tr>
<tr>
<td><strong>Pair 2-Long Jump</strong></td>
</tr>
<tr>
<td><strong>Pair 3-Run.600m</strong></td>
</tr>
<tr>
<td><strong>Pair 4-Rounders ball</strong></td>
</tr>
<tr>
<td><strong>Paired 5-Body hanging</strong></td>
</tr>
<tr>
<td><strong>Paired 6-Shutter running</strong></td>
</tr>
<tr>
<td><strong>Paired 7-Abdominal Strength</strong></td>
</tr>
</tbody>
</table>

*p<0.05

**Discussions and conclusions**

The process of training in performance table tennis means the individual part of training the players and the part of maintaining it in a certain higher level. The individual part of training the players begins with the selection and continues with an instructional training of the athlete personality training according to the performance modern table tennis requisites.

The physical preparation of the table tennis player is an essential factor in sports performance because there is no motor act or action whose achievement does not involve, to some extent, support indices of speed, skill, strength and power.

Starting from the conduct of the current game of table tennis of high performance, characterized by high dynamism, speed of thought, precision, refinement, the display of technique and tactics of the game, always attacking, held at higher speed viable solutions need to be found for improving the organization and training purposes. The first issue we have to consider is that the child is practicing for initiating sports. Getting great performance in sport requires in addition to a harmonious development of all motor skills also further development of specific sports skills.
The use of a regular fitness testing in tennis provides framework for the development of an individualised database and a more efficient programme of the physical fitness training, especially in junior players (Fernandez et al., 2014). The proposed program has proven subjects achieving superior results in most tests conducted. One of the tests was not significant in progress, the running on the 600m distance.

During this period, attention should be given to children with motor skills and mental development indices above the average for their age, following that during the course of preparation to highlight the other specific qualities for this sport.

The proposed program could be improved in some tests because the results have not increased significantly. It is necessary to develop some tests targeting ability to focus attention, balance of the nervous system, capacity for analysis and synthesis of the situation and rapid decision to capitalize the game accumulations at the technical and biological levels.

References
STUDY REGARDING THE SOLICITATION LEVEL OF THE EXERCISES USED FOR LANDINGS TRAINING IN ARTISTIC GYMNASTICS

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Abstract. The preparation of the landings in the training programs are a necessity since in the current Women’s Artistic Gymnastics, in addition of the increased difficulty, it emphasizes fairness and great execution. Thus, landing is one of the most important factors which determine the final rank of gymnasts at competitions. The purpose of this paper is to optimize the preparation of junior gymnasts in terms of landings, identifying the most effective exercises, reported at the effort coefficient (EC). The participants were 21 junior gymnasts, aged 8-10 years old, legitimated at the following Bucharest’s gymnastics clubs CSS Steaua, CSS Dinamo and CSS no.2. In order to achieve the purpose, we have evaluated a series of 17 training exercises used for landings preparation. We have calculated the effort coefficient of each exercise, reporting it to the heart rate that was recorded immediately after the execution and the standard heart rate (the maximum HR at each exercise has been chosen as standard). By analyzing the results, we have discovered that 3 out of 17 exercises are too little difficult (EC is less than 0.70), 8 exercises have an average level of solicitation (EC is between 0.71 and 0.80) and 6 exercises have a high level of solicitation (EC it is between 0.82 and 0.90). Thus, these exercises with a high solicitation level have to be executed daily, during training lessons. That could help at the training programs optimization, in terms of landings and also increase the performance.

Keywords: effort coefficient; landings; Artistic Gymnastics

Introduction

Artistic gymnastics is a sport which requires the gymnasts to perform exercises on different apparatus. Continuous development, changes in many prospects, objectifying the appreciation and not least training approach updating, led to increased difficulty of the exercises presented in the competition, but also to mitigate value differences between the competitors. For this reason, the athletes differentiation is more difficult, the exercises perfection becoming a very important factor for ranking the gymnasts.

The preparation of the landings in the training programs are a necessity since in the current Women’s Artistic Gymnastics, in addition of the increased difficulty, it emphasises fairness and great execution. Thus, landing is one of the most important factors which determine the final rank of gymnasts at competitions (Marinsek & Cuk, 2008).

The landing can be defined as the moment when the gymnast returns with feet on the ground, through the intervention of the external and the internal forces, being performed by progressively bending the lower limbs, slightly bending the trunk, General Center of Gravity projection stabilization within the supporting surface and using arms for balance.

The landing is the final phase of the acrobatic elements, artistic jumps, but also of the vaults executed at the Vault apparatus. In the case of the acrobatic elements and of the artistic jumps, the phases that precede the landing are: take-off and flight. In the case of the vaults executed at the apparatus with the same name, the phases are: running, hurdle onto springboard, the first flight, hands support on table, the second flight and landing (Corlaci, 2010, p. 66). In both cases, as methodical succession, the landing is the first phase to be learned.

As in the case of all the movements, in the landings learning must be respected the accessibility principle, according to which the organization and implementation of the training process is in accordance with the preparation level, with the age and individual particularities of those who are prepared. Classical rules of realization of this principle, from simple to complex, from easy to difficult, from known to unknown, are complemented by the need to consider the age and the preparation of the participants, their ability to acquire new knowledges (Platonov, 2015p. 85).

Thus, the execution of the exercises for landings learning should be done by beginning with simple jumps at floor, and the landing position fixing, then gradually increasing the height from where the jumps are executed and the rotation degrees around the longitudinal axis.

Materials and methods

Study’s place and participants. The participants at this study were of 21 junior III, levels 1 and 2 Junior II. Level 3 athletes, aged between 8-10 years, legitimated at three gymnastics clubs from Bucharest, as follows: 5 gymnasts components of the Scholar Sports Club no.2, 10 gymnasts components of the Scholar Sports Club Steaua and 6 gymnasts components of the Dinamo Sports Club. Also, the testing was held in the gyms of the gymnastics sports clubs mentioned above.
Methods. For this study we have used the following research methods: bibliographical study method, observation method, test method, statistical and mathematical method and computer graphical representation method. The test method was utilized to measure the heart rate immediately after the exercise.

Procedure. To achieve the purpose, we have evaluated a series of 17 training exercises used for landings in Women’s Artistic Gymnastics, through the determination of the effort coefficient. The coefficient of effort is calculated based on heart rate (HR), which was measured for each exercise in the most demanding moments in terms of physiological execution possibilities of each exercise, immediately after this (Nicu, 1992, p. 35). The heart rate was measured by the way of palpation the carotid. After recording the heart rate for each of the gymnasts at each exercise, we have calculated the arithmetic mean of the frequencies collected from the 21 gymnasts participating in our study. Maximum heart rate for each exercise was considered the standard heart rate. Thus, the coefficient of effort was calculated using the following formula:

$$EC = \frac{HR_{mean}}{Standard\ HR}$$

Means of training

Ex.1. At floor, keeping the landing position (1');
Ex.2. From standing, jumping with the knees up and fixing the landing (10 repetitions);
Ex.3. Standing on the balance beam, facing the direction of travel, stretched jump, in depth and fixing the landing (7 reps **);
Ex.4. Standing on the vault table, facing the direction of travel, salto forward tucked, in depth and fixing the landing (5 reps **);
Ex.5. Standing on the springboard with the back to the direction of travel, salto backward tucked and fixing the landing (5 reps **);
Ex.6. Standing on hands on the vault table, facing the direction of travel, corbet and fixing the landing (7 reps **);
Ex.7. Standing sideways on the balance beam, maintaining the position of landing (30');
Ex.8. Standing facing a gymnastics crate lid, stretched jump on the box lid and fixing the landing position, stretched jump with 180° turn on the box lid and fixing the landing (10 reps);
Ex.9. Roll backward to tuck stand, stretched jump with 360° turn, and fixing the landing (5 repetitions);
Ex.10. Standing on the vault table, facing the direction of travel, stretched jump with 180° turn, in depth, and fixing the landing (5 reps **);
Ex.11. Standing on the vault table, with the back to the direction of travel, stretched jump with 180°, in depth, and fixing the landing (5 reps **);
Ex.12. Squat with stretched jump and maintaining the landing for five seconds (10 repetitions);
Ex.13. At floor, salto backward tucked and fixing the landing (5 reps **);
Ex.14. At floor, stretched jump with 360° and maintaining the landing for two seconds (7 reps **);
Ex.15. Sitting on the vault table, facing the direction of travel, jump with the knees up in depth, and fixing the landing (7 reps **);
Ex.16. Sitting on vault table, the back to the direction of travel, jump with the knees up and in depth, and fixing the landing (7 reps **);
Ex.17. Sitting at the end of the balance beam, with the back to the direction of travel, salto backward tucked and fixing the landing (5 reps **);

** There are counted only the landings made without penalty.

Results

To reflect as clear as possible the contribution of each exercise, we have considered necessary the calculation of the effort coefficient, whose results are shown below (Table 1).
Table 1. The results of the solicitation coefficient

<table>
<thead>
<tr>
<th>Selected standardized means</th>
<th>HR</th>
<th>Standard HR</th>
<th>EC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before the execution</td>
<td></td>
<td>After the execution</td>
<td></td>
</tr>
<tr>
<td>Ex.1</td>
<td>95</td>
<td>95.1</td>
<td>126</td>
</tr>
<tr>
<td>Ex.2</td>
<td>88</td>
<td>114.33</td>
<td>140</td>
</tr>
<tr>
<td>Ex.3</td>
<td>90.38</td>
<td>125.33</td>
<td>168</td>
</tr>
<tr>
<td>Ex.4</td>
<td>106.33</td>
<td>151.33</td>
<td>200</td>
</tr>
<tr>
<td>Ex.5</td>
<td>84.1</td>
<td>132</td>
<td>158</td>
</tr>
<tr>
<td>Ex.6</td>
<td>107.33</td>
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</tr>
<tr>
<td>Ex.7</td>
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<td>118</td>
</tr>
<tr>
<td>Ex.8</td>
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</tr>
<tr>
<td>Ex.9</td>
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</tr>
<tr>
<td>Ex.10</td>
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<td>Ex.16</td>
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<tr>
<td>Ex.17</td>
<td>98.67</td>
<td>125.33</td>
<td>206</td>
</tr>
</tbody>
</table>

The graphical representation of the results obtained by the effort coefficient is presented in Fig. 1.

![Graphical representation of the solicitation coefficient](image)

**Fig.1.** Graphical representation of the solicitation coefficient

**Discussions and conclusions**

The achieving of some effective training programs must be done through the design and selection of appropriate exercises for the type of lesson, the level of preparation and the preparation period. Choosing the most
effective means of training must be carried out by using scientific methods, with which it could be checked their usefulness.

The results obtained by the coefficient of effort helped us to prioritize and select the best training exercises for landing, depending on the solicitation coefficient of each athlete. Thus, we conclude that 3 out of 17 drills are too little solicitant (EC less than 0.70), 8 exercises have an average solicitation level (EC is between 0.71 and 0.80), while 6 exercises have a high solicitation level (EC is between 0.82 and 0.90).

These exercises with a high level of solicitation must be done daily, during the training lessons. This can help to optimize the training programs in terms of landings and also, to increase the performance.

References
ASPECTS OF THE RELATION BETWEEN SPORT ACTIVITIES AND FITNESS ELEMENTS IN YOUNGSTERS WITH DOWN SYNDROME

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Abstract. Improvement of life quality is a top goal for the society where we live in because industrialization and daily stress to which are subjected the individuals, with or without disabilities, exceed their adaptation ability. Practicing sport activities, carefully conducted, is an element of the education which aims to counteract the adverse effects of the sedentariness, stress and high-technologies, as well as to address the two conditions by which health expresses: absence of diseases and health promotion, meaning „the intentionality and actions for the health condition improvement, the fitness accomplishment, the increase of the ability to undertake medium efforts during a reasonable period of time” (Epuran, 2013, p. 351).

Individuals with disabilities must associate the occupational therapy with exercising of sport activities within a complex intervention programme, followed by them with the aim to overcome the obstacles existing between them and the others, to maintain or improve their health condition and, implicitly, to increase their quality of life.

At European level, the motor activities were included within the „recognized rights of the individuals with disabilities enabling the operation of nondiscrimination principle also within this segment of population” (Teodorescu et al., 2007, p. 3). Therefore, sport activities offered to the individuals with disabilities diversified (Teodorescu et al., 2007, p. 7), hereinafter listing only three types of programmes in the field of physical education and sport:

- adapted programmes, which imply the amendment of regulations or the adjustment of execution techniques in order to be accessible for all disabled persons;
- corrective programmes, which imply the use of means specific to sport branches in order to correct the physical disabilities associated to severe health problems;
- development programmes, which aim to train the motor qualities and to learn special motor abilities and skills, by the end of practicing the relevant sport discipline for long time as recovery and social inclusion means.

Because they act synergistically, those programmes have beneficial influences both in cognitive terms, by acquire of knowledge and abilities applicable in the daily life, as well as in affective terms, with regard to motivation, interests, feelings etc. Thus, the influences of the sport programmes are precisely outlined and we can directly and constantly act over different indicators taken into consideration when it comes to quality of life (Ştunescu, 2012, p. 8). Among those indicators there are also the fitness elements, which are maintained and/or trained according to the possibilities of the disabled individuals but also in close correlation with the genetic conditioning of those elements.

For fitness elements, studies developed on this topic highlight that undertaking of aerobic efforts for 12 weeks by individuals with Down syndrome has a “positive impact over the different fitness elements” (Boer & Moss, 2016). Other studies prove that practicing of motor activities contributes to the development of force (Lynnès, et al., 2009; Liet al., 2013) and equilibrium (Lewis & Fragala-Pinkham, 2005; Liet al., 2013), while mobility remains at the same level (Terblanchel & Boer, 2013), regardless of the activity practiced.
Furthermore, the opinion of Terblanchel and Boer (2013) is that individuals with Down syndrome must participate in individualized sport programmes comprising motor abilities and skills from sport branches, exercised with pleasure. Those individuals, who want to exercise them further, for a longer period of time, can obtain the wanted effects over the fitness elements.

Materials and methods

**Scope and participants.** This study aims to identify whether practicing regularly different sport branches contributes to maintaining and/or training of different fitness elements in case of two young persons diagnosed Down syndrome. Those young individuals, members of a non-governmental organization (NGO) dedicated to disabled individuals, have regularly participated in sport programmes proposed by the relevant NGO: gymnastics, swimming, dance and motion games, to which occupational therapy was also associated.

**Hypothesis.** The training level with regard to different fitness elements can be maintained and/or developed by practicing diversified motor activities.

**Methods**

To assess the different fitness elements we used the tests battery intitled „FUNfitness” (Special Olympics International, 2013), designed by American kinetotherapists and applied by Special Olympics International in the testing events within the „Healthy Athletes – FUNfitness” Programme. By using such tests battery, it was assessed the mobility, strength, balance and aerobic resistance. Each element was considered by using one or several items:

- **mobility** – of the hamstring, calf, shoulder rotator („Apply” test), and hip flexor muscles; To perform the first test was used the goniometer, except for the „Apply” test, where assessment was made by using the measure tape;

- **strength** – at the level of lower and upper limbs, abdomen and hands. Assessment was performed depending on the number of executions against duration in case of lower limbs and abdomen muscles, hold keeping against duration in case of upper limbs muscles, as well as by using the dynamometer, in case of hand muscles;

- **balance** – static and dynamic balance, single leg stance (with eyes open and closed) and functional reach test. The functional reach test (performed forward) is a simple method to quantify balance that allows use of visual cues, but perturbs body position. The test procedure requires the performer to reach forward beyond the length of his/her arm without losing balance. The preferred position for this test is standing, but it can also be done sitting. For balance assessment with opened and closed eyes, keeping the position against duration was considered, while for the assessment of the functional reach test, the tape measure (meter stick) was used;

- **aerobic fitness test** – 2 minutes step test (on the spot) – the ability to step for two minutes without undue fatigue. Submaximal aerobic tests assess cardiovascular and pulmonary efficiency, in this case, the number of steps made was counted but also the heart rate (HR) trend and oxygen saturation before, immediately after and 2 minutes after the effort (recovery). The pulse oximeter is used to measure both heart rate and oxygen saturation (O₂ Sat).

For each test, the American experts formulated limits based on the data collected from thousands of children, young people and adults with intellectual disabilities. Based on professional knowledge of what is within the appropriate range for the age and participation level of each tested person, education may be recommended. If the assessed persons obtained results lower than the limits recommended by the experts, physical therapists discussed with participants, families and coaches the components of a good fitness program for risk prevention, and made recommendations for optimal function in sports training and competition so that the athletes train and compete safely. All the exercises recommended to be practiced subsequently to testing aimed to train the poor fitness elements in case of the disabled person in question.

The tests battery was applied during the Special Olympics National Games in Romania, within the Healthy Athletes Programme. The same tests were applied every year. The first testing event took place in June 2013 and was considered by us the initial testing, the second testing was carried out in June 2014, representing the intermediate testing, and the third testing took place in June 2015, being considered the final testing.
Results

Following the centralization of the data collected after the application of the „FUNfitness” Test Battery, we obtained the following results:

Table 1. Mobility – knee joint

<table>
<thead>
<tr>
<th>Reference value</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
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<tr>
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<td>-20°</td>
<td>+5°</td>
</tr>
<tr>
<td>AM left</td>
<td>0°</td>
<td>0°</td>
<td>0°</td>
</tr>
<tr>
<td>CB right</td>
<td>-10°</td>
<td>-5°</td>
<td>-10°</td>
</tr>
<tr>
<td>CB left</td>
<td>0°</td>
<td>0°</td>
<td>0°</td>
</tr>
</tbody>
</table>

Table 2. Mobility – ankle joint

<table>
<thead>
<tr>
<th>Reference value</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM right</td>
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<td>+15°</td>
<td>+15°</td>
</tr>
<tr>
<td>AM left</td>
<td>+20°</td>
<td>+20°</td>
<td>+20°</td>
</tr>
<tr>
<td>CB right</td>
<td>+25°</td>
<td>+30°</td>
<td>+30°</td>
</tr>
<tr>
<td>CB left</td>
<td>+30°</td>
<td>+30°</td>
<td>+30°</td>
</tr>
</tbody>
</table>

Table 3. Mobility – coxofemoral joint (hip flexor muscles)

<table>
<thead>
<tr>
<th>Reference value</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM right</td>
<td>-10°</td>
<td>-20°</td>
<td>-5°</td>
</tr>
<tr>
<td>AM left</td>
<td>-20°</td>
<td>-10°</td>
<td>0°</td>
</tr>
<tr>
<td>CB right</td>
<td>-10°</td>
<td>0°</td>
<td>0°</td>
</tr>
<tr>
<td>CB left</td>
<td>0°</td>
<td>0°</td>
<td>0°</td>
</tr>
</tbody>
</table>

Table 4. Mobility – scapulohumeral joint (Apply test)

<table>
<thead>
<tr>
<th>Reference value</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM right</td>
<td>+6cm</td>
<td>+5cm</td>
<td>0cm</td>
</tr>
<tr>
<td>AM left</td>
<td>0cm</td>
<td>0cm</td>
<td>0cm</td>
</tr>
<tr>
<td>CB right</td>
<td>+2cm</td>
<td>+6cm</td>
<td>0cm</td>
</tr>
<tr>
<td>CB left</td>
<td>0cm</td>
<td>0cm</td>
<td>0cm</td>
</tr>
</tbody>
</table>

Table 5. Strength – lower limbs muscles

<table>
<thead>
<tr>
<th>Reference value</th>
<th>10 lifting in maximum 20 seconds (Association of American Kinetotherapists)</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>15.68sec</td>
<td>12.00sec</td>
<td>13.00sec</td>
<td></td>
</tr>
<tr>
<td>CB</td>
<td>12.57sec</td>
<td>18.00sec</td>
<td>17.00sec</td>
<td></td>
</tr>
</tbody>
</table>

Table 6. Strength – abdomen muscles

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>20</td>
<td>25</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>CB</td>
<td>23</td>
<td>25</td>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>
Table 7. Strength – hand muscles

<table>
<thead>
<tr>
<th>Reference</th>
<th>Minimum KgF established depending on the age (Association of American Kinetotherapists)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>2014</td>
</tr>
<tr>
<td>AM</td>
<td>36, 34</td>
</tr>
<tr>
<td>CB</td>
<td>21, 18</td>
</tr>
</tbody>
</table>

Table 8. Strength – upper limbs muscles

<table>
<thead>
<tr>
<th>Reference</th>
<th>Minimum 5 second keeping (Association of American Kinetotherapists)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>2014</td>
</tr>
<tr>
<td>AM</td>
<td>20sec</td>
</tr>
<tr>
<td>CB</td>
<td>20sec</td>
</tr>
</tbody>
</table>

Table 9. Balance – single leg stance with eyes open

<table>
<thead>
<tr>
<th>Reference</th>
<th>Minimum 20 second keeping (Association of American Kinetotherapists)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>2014</td>
</tr>
<tr>
<td>AM</td>
<td>30sec, 30sec</td>
</tr>
<tr>
<td>CB</td>
<td>7sec, 12sec</td>
</tr>
</tbody>
</table>

Table 10. Balance – single leg stance with eyes closed

<table>
<thead>
<tr>
<th>Reference</th>
<th>Minimum 10 second keeping (Association of American Kinetotherapists)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>2014</td>
</tr>
<tr>
<td>AM</td>
<td>7sec, 7sec, 5sec, 8sec</td>
</tr>
<tr>
<td>CB</td>
<td>10sec, 10sec, 10sec</td>
</tr>
</tbody>
</table>

Table 11. Balance – functional reach test

<table>
<thead>
<tr>
<th>Reference</th>
<th>Minimum 20cm; a difference not less than 10cm between the right side and the left side (Association of American Kinetotherapists)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>2014</td>
</tr>
<tr>
<td>AM</td>
<td>51cm, 45cm, 42cm, 63cm</td>
</tr>
<tr>
<td>CB</td>
<td>19cm, 18cm, 29cm</td>
</tr>
</tbody>
</table>

Table 12. Aerobic fitness test

<table>
<thead>
<tr>
<th>Reference</th>
<th>Symptoms found by the assessor: fatigue, sweat excessively, a.o. (Association of American Kinetotherapists)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>a, b, c</td>
</tr>
<tr>
<td>AM</td>
<td>80, 100, 88</td>
</tr>
<tr>
<td>CB</td>
<td>76, 100, 84</td>
</tr>
</tbody>
</table>

a – heartbeats/ minute – pre-exercise HR, b – heartbeats/ minute – post-exercise HR, c – heartbeats/ minute - 2 minutes post-exercise HR
Discussions and conclusions

From the very beginning, we must mention that the method to apply the „FUNfitness” Test Battery depends on the professional experience of those who apply the items, but also on the condition of the person at the time of the testing, as well as the activities performed by the person before coming for testing.

With regard to the element named „mobility”, we observed the maintenance of level acquired from a testing to another for the ankle and knee joints. For shoulder mobility (Apply test), we observed the maintenance of level acquired from one testing to another. We consider that a good training level for the mobility is important both in self-care and daily activities, as well as in sport activities practiced by our participants. We hereby mention the swimming, where a good mobility of ankle joint enables a better finalization of the feet motion in all technical procedures. At the same time, good mobility of coxofemoral and scapulohumeral joints enables technically correct movements in gymnastics.

The most obvious modifications were with regard to strength. Hence, the study participants succeeded to improve their results at abdomen muscle testing in the final battery, AM executing a number of repetitions by 12 more than those executed in the initial testing, while CB improved his initial result by 8 repetitions in addition. The strength development was obvious also at the level of the hand muscles. Both youngsters improved their results from a testing to another, but the increase was more obvious to CB (the right hand force increased with 6Kgf, and the left hand force, with 8Kgf). At the test addressed to upper limbs, maintaining of the training level was found, that test being easily performed for our subjects because they practiced artistic gymnastics and worked at parallel bars where the relevant motion is encountered. Data for lower limb vary from one testing to another, but all the results are lower than the reference value given by the American experts.

For balance – AM maintained the training level in case of testing the equilibrium with opened eyes. For single leg stance test with eyes closed, values lower than the reference values are found but it has been well known that athletes suffering of Down syndrome show a deficit to level both under static conditions and under dynamic conditions (Cernea et al., 2015). In contrast to AM, CB obtained better and better values for the balance with opened eyes, while for the single leg stance test with shut eyes, the values experienced a slight increase. With regard to the functional reach test, AM recorded values higher than the reference values. CB recorded at the initial testing, results lower than the limits indicated. At intermediate and final testing events, the coefficients showed increases both for right side and for left side.

For resistance – we measured the heart rate values (HR) by using a pulse oximeter. The heart rate was measured pre-exercise, post-exercise and 2-minutes post-exercise. It must be mentioned that the values measured were affected also by the activity performed by the athlete before testing and by his fatigue degree. In the case of our athletes, we found that both of them have a good level of adaptation to effort. The heart rate values recorded at the beginning of the test increased after the effort, which is a very normal thing. Recovery after effort was good, as proved by the pulse recorded 2 minutes after the end of the test.

An intervention programme rich in motor activities, which includes diversified motion systems and takes into account the preferences and interests of the young people with intellectual disabilities, has beneficial effects over them as expressed in all their daily activities. Association of those activities with the occupational therapy provides the young people with effective methods to build a new identity based on their existing abilities, multiplies their options of readmission within the origin environment and can bring them huge satisfaction next by their fellow people.

Youngsters with Down syndrome can maintain their training fitness element levels as a result of practicing different motor activities. The data of our study confirm that some fitness elements (strength, resistance, balance) can be trained, while others (mobility) remain at a constant level specific for the relevant disability category. Although the values expressed under the form of degrees, number of repetitions, maintenance duration, are low compared to the values recorded by other categories of disabilities, they are important for a segment of the inactive population, with limited wellness opportunities and few experts willing to get involved.

Acknowledgements

The authors would like to thank Special Olympics Romania’s athletes and administrators who willingly gave permission to use the data for this study. Additional thanks are extended to volunteers who assisted with data collection.
References


BASIC PRINCIPLES OF KINETIC PROGRAMS

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Abstract: The basic principles of kinetic programs, essential for the design and development of exercises are: breathing, alignment, stability, articulation, integration, fluidity and dynamism. Each of these principles is instrumental and requires an individual approach. Intelligent movement is unequivocally determined by the convergence and integration of these principles into an inseparable whole. Building movement from inside out, my concept of Fusion Dynamics is centered on the fluid, unified and integrated corporal expression, on focus and introspection through the senses, with the ultimate goal of making exercise an artistic expression of movement.

Keywords: alignment, stability, fluidity, integration, dynamism

Introduction

In order to approach the basic principles of kinetic programs, it might be adequate to start with correctly defining these programs. A kinetic program is the type of functional training that has a definite purpose and clear objectives (Burton, 2007). One of its main objectives would be to prepare the individual for current everyday life activities, aiming at minimizing the risk of accidents. Simply stated, kinetic programs teach the individual how to use his/her body on all movement plans, in all circumstances of everyday life. This composed framework of body coherence in movement and action integrates balance and proprioception elements (Orr, 2013) in order to increase the body awareness level of the subject. Generally, the characteristics of kinetic programs presuppose individualization, integration, progression, functional tasks, periodicity, variation, repetition and contextualization. The concepts of functional training and kinetic programs are not new, yet detailed information in reference to these topics is scarce at national and not as abundant as one might expect at international level. The basic principles we have described and detailed below are part of a thorough research we approached for the past years of practice in the field.

Issues Addressed

The basic principles of kinetic programs, essential for the design and development, are: breathing, alignment, stability, articulation, integration, fluidity and dynamism. Each of these principles is instrumental and requires an individual approach. Intelligent movement is unequivocally determined by the convergence and integration of these principles into an inseparable whole.

Breathing is often considered a natural process, however many people do not know how to breathe properly, consciously.

The observer’s viewpoint is essential in the process of breathing. The way we breathe directly affects the quality of movement and also the effectiveness of selected exercises. A correct breathing movement promotes a natural flow of energy through the muscles, positively stimulating their activity. The association of physical movements with breathing rate increases body’s resistance to effort, the focus on exercise and accuracy of its execution. Breathing is an integral part of the fluid movement. During thoracic breathing, we use the diaphragm and intercostal muscles to stabilize the torso. Torso movements focus mostly on increasing and decreasing of intrathoracic air volume. These volume variations produce changes in the chest wall, on the vertical, transversal and anterior-posterior dimensions. Abdominal breathing stabilizes the lower abdomen, using the related muscles and sacrum breathing and brings an extra energy flux at the deep cellular level. If every physical movement is accompanied by an active and conscious breathing, this creates a deep connection between them at muscular level, thus reaching a performance execution of the exercise. Throughout the exercises that I designed, I described some types of breathing used in yoga practice, with beneficial results at all levels. The psychosomatic effects of breathing exercises and their usefulness in many circumstances (panic attacks, hyperventilation, etc.) are well known. A conscious breath, acknowledged and accurately coordinated, brings benefits such as stabilization and optimal articulation of the spine, axial elongation and its control, fluid scapular movement etc.

Correct alignment should precede any type of exercise, static and / or dynamic.

Postural attitudes are a conjuncture of different positions of body joints at a certain time, and static postural alignment is defined in terms of relationships between different parts of the body and joints. Correctly working on
an alignment exercise improves posture and thus prevents potential injuries. An incorrect alignment creates unnecessary stress and tension that affects the supporting structures of the body. The spine has natural physiological curves and limb bones are aligned so that body weight is optimally and equally distributed. The neutral position of the pelvis leads to a correct alignment of the abdomen, torso and lower extremities. Ideal alignment of the scapular-humeral belt influences and is influenced by the position of the scapula. An optimal alignment includes pelvis in neutral position, neutral position of the rib cage, scapula-humeral belt alignment, correct position of the head (in continuation of the spine) and limbs alignment. In other words, there is a central axis (spine) and two axes perpendicular to this line, the line that unites the hips and the shoulder line. These three axes create a framework that is the focus of each of my exercises. Alignment control is achieved in all three axes and is maintained during the exercise, so that the entire body develops uniformly, vigorously and dynamically. Psychological component is not to be neglected in this case, good posture and a physically aligned body resulting in an increased self-esteem and confidence.

*Stability* is the ability to remain unchanged and could be assimilated to the notion of balance.

Stability means also the ability to be stable, solid, durable; synonymous with solidity, constancy; firmness, or property of an object to maintain its position or return to the original position. It goes without saying that the principle of stability is essential for my physical therapy exercises. Achieving body stability depends on a base, as ample as possible, supporting the motion, a center of gravity placed closer to the ground and above the supporting base, the grip to the ground and the toeholds, the body weight and individual mobility (Orr, 2013). The focus and/or the level of concentration on the movement is essential, as movement becomes more controlled and thus improves stability and balance. Getting a stable position is an exercise itself, even before beginning execution of a certain movement. To increase stability, exercises are practiced in different working conditions, alternating static and dynamic positions that do not respect the same principles of stability. This method could be briefly described as a "destabilizing in order to stabilize" and is used to improve individual stability (Spennenwyn, 2008).

Movement *articulation* is essential to learn an exercise, improving the awareness regarding the stable or mobile segment used in the dynamics and fluidity of execution, as well as the connection between these segments. With a focus on articulation, we can easily understand the hot spots, difficulties of individual execution and areas that need quality improvement (usually at the spine level). Articulation results in a better coordination and thus moving stability, supports the optimal exercise pace and postural alignment.

*Integration*, as a principle, means a common, synergistic, articulated awareness of movements, merging them into a whole perfect harmony. Integration occurs when all principles of movement are assimilated and successfully applied in new exercises or individual practice of spontaneous movement, hence deriving extra motivation and good mood, psychologically associated with personal success. Integration principle gives more autonomy to the person who practice kinetic exercises in my program; each individual can add new movements integrated within the usual exercises, continuously seeking new limits of his own physical ability and effort.

*Fluidity*. Usually, the principle of fluidity has deep philosophical connotations related to how the water flows along obstacles, passing over obstacles, always finding its way, avoiding obstructions and discontinuities in the road. It is equally important to keep these movement characteristics derived from water fluidity principle. Thus, the fluid, easy, continuous, economic movement avoids overloading and stress on muscles and joints. It is well known that, with age, people gradually lose their coordination and fluidity of movement, and hence the need and importance of stimulation and training of these physical abilities, since they are so closely correlated with individual balance, strength and flexibility (Burton, 2007). The fluidity of movement defuses tensions, brings grace and harmony. From martial arts to contemporary modern dance, movement fluidity is visible, harmonious and aesthetic. This fluidity principle combines all other principles of movement, integrating them in my method and practice of related exercises.

*Dynamism*. It is imperative today, in a century of spontaneous movement and evolution on all levels, to integrate exercise into daily life dynamic, animated by the movement principles extensively detailed above. Intelligence of movement is essential and an integral part of motor/practical intelligence of each individual. It is important to know how to listen to your body, to intelligently and deeply know yourself, both physically and mentally, so as to live fully, extensively, in a social, cultural and professional-integrated manner, completely enjoying your life. A dynamic person is active and responsive to the demands of a society in evolution, constantly active towards continuous personal development.
Conclusions

Thus, breathing techniques are adjusting to and coordinated with body movements, muscle control, improved by joint mobility and stability, based on an optimal alignment, leading to the fluidity of movement. A balanced connection between muscle and center also lead to the harmonization of all extremities movements and integration of all muscle groups in one motion. Aware of the importance of this principle of movement, professional dancers, for example, regardless of their morphological and constitutional differences, perfectly integrate their movements in a fluid and harmonic whole, correlating coordination with the proprioceptive system. Motor control comes from learning and practicing integrated dance movements, retained as a pattern in their neuromuscular system and is not necessarily related to their physical condition. Building movement from inside out, my concept is centered on the fluid, unified and integrated corporal expression, on focus and introspection through the senses, with the ultimate goal of making exercise an artistic expression of movement.

References


INTRODUCTION

The growth and development of children is one of the problems with great theoretical and practical significance to the scientists. Can be said that, the data in this field are numerous, the more are opening new horizons of research. Worldwide, in the last century, especially in recent decades, it was noticed in children and young people, an important biological phenomenon called "Secular Trend". The term Secular Growth Trend (SGT) describes any change in body size or composition in a given population group over long time periods.

Generally, the mean height and weight of children and adolescents today are higher compared to the values of the past century. The data literature, it follows a first general observation, namely that the growth and development of children is not proceeding in a uniform way. Along the way, there are periods of acceleration and slowdown, with variables durations, in relation to age, living conditions and individual characteristics of children.

In 2012 a US study analyze the relationship of obesity levels with the fitness levels of public school children in Louisiana. Over 7000 school children participated in body mass index (BMI) and Fitnessgram®. The results indicated that the participants with healthy BMI have the highest levels of physical fitness. The differences between the fitness levels of obese and healthy children were statistically significant. This study demonstrated a direct relationship between BMI status and fitness levels among study participants (Joshi, Bryan & Howat, 2012).

Another study done in Hong Kong examined the relationship between body mass index (BMI), physical fitness and motor skills in a large sample of youth with mild ID. A systematic, stratified sampling method was used to select 444 youth with mild ID, aged 6-18 years, from eight special education schools in Hong Kong. Physical fitness was assessed using items from the national Hong Kong assessment: 6- (ages 6-8 years) or 9- (ages 9-18 years) minute run, sit-up, isometric push-up, sit and reach, and sum of skinfold. Functional motor skills were assessed in 244 youth from the fitness sample using the Test of Gross Motor Development-II. Approximately 20% of the sample was classified as overweight/obese (Frey & Chow, 2006). Results for age and gender revealed group differences in the run and push-ups, but not in the motor or other fitness variables. After controlling for age and gender, BMI was correlated with the run and push-ups. Age and gender were entered as the first block in hierarchical regression and accounted for most of the variance in all dependent variables, except sit and reach. The inclusion of BMI in the second block added to the model for run and push-ups only, push-ups (Frey &Chow, 2006).

Data in the literature shows that there is great individual variability of the particularities morphological, functional and psychical for the individual's chronological age of the same, but this variability is smaller that if we group kids by physiological age (http://web.profudesport.ro). Some authors show that for children born and grew up in the city there is a growing of the waist faster than for those living in villages, but the thoracic perimeter and weight do not grow at the same pace. In some cases occur disproportions between longitudinal and transverse...
dimensions of the body, and in other cases the acceleration is limited to sexual maturation. The study conditions and factors that determine the phenomena of acceleration and developmental delay highlights the influence of civilized life, improved nutrition, advances in prophylaxis and treatment of diseases and the benefits of a more rational organization of work and leisure time of the youth. Some authors believe that the accelerated growing would be reduced to sexual maturation, and other morphological and physiological qualities. The cardiovascular system of children seems to respond differently to exercise when compared to adults (Braden et al., 1990). One of the main adaptations to aerobic training is the ability of the heart to increase its pumping capacity (Cardiac Output L/min-CO) in response to increasing work load which in turn brings about an increase in one’s maximum oxygen consumption (VO2Max). The initial increase in CO at the onset of exercise is met by an increase in Heart Rate (HR) and Stroke Volume (SV). Stroke volume usually increases up to an intensity of 50 to 60% of one’s VO2Max, whereas, HR continues to increase to maximal intensity. Cardiac output is classically defined (Betts et al., 2013) alongside stroke volume (SV) and the heart rate (HR) as:

\[
CO_{[L/min]} = SV_{[L/beat]} \times HR_{[beats/min]}
\]

Similar to adults, children who undergo a controlled aerobic training program improve their cardiovascular endurance.

The VO2Max increases in children, however, are lower (5 to 10%) than those usually seen in adults for similar training programs -15 to 30% (Mandigout et al., 2001). For instance, children have lower cardiac output at a given oxygen consumption (VO2) when compared to adults. In addition, heart rate recovery has been reported to be faster in children as compared to adults (Turley, 1997). Further, there appears to be no differences in gender as related to gains in cardiovascular fitness in children after an aerobic training program (Obert et al., 2003).

**Fig. 1. Major factors influencing cardiac output** (Betts et al., 2013)

The purpose of this study has been the application of mathematical models and laws of variation in the analysis the relationship between accelerated growth objectified by parameters: height, weight, BMI and cardiac endurance at junior athletes (6-12 years), members of sports clubs, they practice of sports games (football).

**Materials and methods**

Study was carried out in 2016 on a number of 124 participants, male, aged between 6 and 12 years, they are members of some clubs in Bucharest. Individual investigation was performed at the Centre for Interdisciplinary Research in NUPES in collaboration with the Center for Sports Medicine - GRAL after obtaining parental consent and informed consent of participants. For obtaining necessary data, direct methods were used: anthropometric (height and weight) based on which was calculated body mass index (BMI) and the oxygen (O2) saturation in arterial blood (SpO2). The cardiac endurance was estimated using the test Ruffier. This index provides exactly the required parameters: the tonic myocardium state before the effort (resting heart rate), adaptability in the effort (target heart rate) and possibility for the myocardium to return to normal after exercise (heart rate recovery). For
this purpose we used a standard exercise, consisting of 30 squats (using J.E.Ruffier). The Ruffier index (IR) was calculated using the formula: P1 + P2 + CI = -200 / 10 P3 (where P1 = number of beats/minute at rest, P2 = number of beats/minute after exercise, the first 10 seconds, P3 = number of beats/minute to 3 minutes after exercise). Data collection was performed using portable medical device - Oxi-Capnography (Pulse Oximeter) MD-660P. To the device, various peripherals can be connected, for the measurement of parameters: peripheral capillary oxygen saturation ($S_{pO_2}$), heart rate (HR), concentration of carbon dioxide in the expired air (EtCO$_2$), respiratory rate. This is a noninvasive method that provides precise results that can be processed in real time, using software Smart Link V; that application converts data into information stored on physical curves. Through an easy to use interface, the user can store and follow long time information on dynamic parameters tested.

Statistical data processing was performed using mathematical models. To model mathematically, view, process data, and determining the mathematical law of variation of BMI and IR, we used variational mathematical calculation using some methods for determining the laws of variation of those indicators (variables) with two types of mathematical regressions: logarithmic regression and polynomial regression. The method of determination is in creating within the Microsoft Office Excel software, a function of the type of matrix £ (m, 1), m rows and 1 column, in this case, 124 lines and one column £ (124,1), where the number 124 represents the number of subjects with valid data and with the features of this program, XY Scatter. The confidence R shows fidelity to of the law of variation as determined and objectivity of the method of determination and representation of the law of variation of the parameters studied.

Results

The processing and analysis of the results, gathered with medical device Oxy Capnography (Pulse Oximeter) MD-660P and software Smart Link V, followed data distribution and correlation between the BMI and IR. As a method, there have been used a functional matrix in Excel 2007, on the type £ (124,2), above which the we applied XY Scatter functions in Excel 2007 and resulted the distribution (viewing) presented in Fig. 3. In the functional matrix, the 124 lines represents the number of subjects (124) and the two columns represent the values of parameters BMI and IR determine the in 124 participants.
The calculation of the correlations was conducted with two types of regression, the laws of variation, logarithmic regression and polynomial regression (Fig. 4).

**Fig. 3. The distribution of the parameters BMI and IR**

![Distribution of parameters BMI and IR](image)

**Fig. 4. Laws of variation of BMI and IR**

![Laws of variation of BMI and IR](image)

**Fig. 5. The correlation between the BMI and IR**

![Correlation between BMI and IR](image)
The distribution data shows the areas that overlap and simultaneously the same trends (increasing) and R of confidenceindices are acceptable Rlog. = 0.1161895 and Rpol. = 0.0624499 (Fig.3).

The mathematical equations determined by two methods of calculation using polynomial regression and logarithmic (Fig.5) confirmed the existence correlation between BMI and IR trends simultaneous graphical representations of the laws of variation (Fig.4) are identical.

Discussions and conclusions

This study demonstrated a direct relationship between anthropometric parameters (BMI) and cardiac endurance (IR) as measured by the among study participants (athletes juniors). This finding is not exceedingly surprising, as common sense tells us with as the child has a weight greater, the less likely he to have a good cardiac endurance.

The novelty of the study is that the existing correlation between BMI and IR is proved by mathematical modeling, regression variation laws, methods which confer precision results and predictive capabilities to a higher level.

References


A COMPARATIVE ANALYSIS BETWEEN THE CONCEPTS OF PUBLIC RELATIONS AND MARKETING IN SPORT

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Abstract. Due to its unique nature, sport demands its own PR expert. In the last few years, it has become obvious that public relations in sport and marketing in sport have become two completely different entities, which means that public relations cannot be considered as part of sports management. Whereas the main objective of sports marketing is to make sure that the sports entity is profitable, the main objective of PR in sports is to establish and maintain long term relationships. Obviously, the priority is the profit, but it is about much more than that. This research aims to comparatively analyze and to clarify the differences between these two aspects, based on data and information from professional literature. Methods: the comparative analysis of the data in the professional literature. The results ensure the clarification of differences between these two aspects based on the data and information collected and better understanding of the concepts. This study is a part of the research project for the doctorate thesis entitled: The contribution of communication and public relations for achieving success in professional sports.

Keywords: sport; PR; marketing;

Introduction

Although the importance of communication in the social life is unanimously recognized, the importance of public relations (PR) in the sports world is somewhat neglected in Romania. This paper is a study in which the authors of this paper aimed to emphasize the importance of PR in professional sports and to clearly define the similarities, differences, and the common points between the terms PR and marketing in the world of sports, in order to avoid confusion, and to clearly understand each term’s field of study.

PR and marketing are part of the same social sphere, but with a lot of differences, given that they have independent purposes. With that being said, one can speak of an interdependence between communication, public relations and marketing, because at their core, they are interdependent. Public relations are impossible to do without communication, and marketing is impossible to do without public relations.

This research will clearly emphasize the working objectives for each field, by defining the terms, the purposes, the objectives, and the means of accomplishing the PR and marketing strategies.

“Sports marketing is composed of all activities aimed to meet the needs and wishes of sports consumers through a sale-purchase. Sports marketing developed two main branches, marketing for sports products and direct services for sports consumers, and marketing for the other sports promoting commercial and industrial products” (Mullin et al., 2007, p. 11)

“Marketing science has an applicative character. The concepts it operates with, such as market, demand, offer, prices, etc benefit not only from theoretical and abstract approaches, but also and especially from a rigorous operationality, which consists of the possibility to quantify the main dimensions and structures of the ways of format and manifestation in the economic reality” (Mitrea, Boboc & Cristea, 2000, p.8).

Pricopie (2011, p. 7) has made a synthesis of the most known and relevant definitions of public relations. Thus, the author mentioned above presents the definition of the British Institute of Public Opinion according to which: public relations are a deliberate, planned and sustained effort to establish and maintain the reciprocal understanding between an organization and its public.

The Danish Public Relations Club concluded that public relations represent a sustained and systematic managerial effort through which the public and private organizations try to get the understanding, liking, and support of the type of public they are trying to reach. The Deutsche Public Relations Gesellschaft (“German Public Relations Association”) says that public relations represent a conscious and legitimate effort to acquire understanding and to maintain the public’s trust based on systematic studies (Pricopie, 2011, p.8).

The International Public Relations Association sees public relations as the art and social science of analyzing certain tendencies, of anticipating their consequences, advising the leaders of an organization and implementing action programs that would serve both the interests of the organization and of the public.

Although for long period of time public relations were considered unworthy to be an academic field, in the 19th and 20th centuries, they have experienced an increased interest from researchers, proving to be much more than an academic field. They are a means of communication, of influence, of informing the public opinion. From the definitions given by the various public relations associations, one can conclude that public relations are not merely important for an organization, they are more than that. They represent the main means of communication.
between the organization and its public. They are the way through which organizations are regulated and self-regulated according to the public demands. The organizations are putting effort into obtaining the liking, understanding and support of their public.

Public relations consist of promoting commercial information in the most believable way possible, this being considered more credible than advertising.

However, one must always make the difference between the theory of public relations as an academic field, and public relations as they are applied in practice. The first component is theoretical, while the second is applicative, being based on the first.

One of the most detailed and comprehensive analysis of PR activity was done by Wilcox et al. (2000). The basic components of PR activity, according to Wilcox et al. (2000, p.9), are presented in Fig. 1.

![Fig. 1. The basic components of PR activity (Wilcox et al., 2000)](image)

Through the counseling process, the public relations expert gives advice to the organization management in regards to the actions that must be performed or improved, and establishes, with the managers, the necessary strategies for reaching the set objectives.

The market research is fundamental for the public relations expert. Only through a continuous research, the PR expert can determine the type of reaction the public can have to a particular strategy. This process highlights the attitude and the behavior of the target audience and the degree of reactivity of the public to a particular public relations strategy.

This research can have two purposes: the generalization of mutual understanding between the organization and the public, or influencing and convincing the public.

A good PR expert will know how important the relationship with the media is, and will act appropriately. Through a good collaboration with the media, an organization can have an enormous amount of advantages, no matter the situation the organization is in. The public can be informed about the potential problems, and will be kept posted in regards to what is going on inside the organization. Transparency is the key to the public’s loyalty.
Advertising aims to spread messages that promote the organization’s interests, which the public relation expert represents.

The relationship with the employees/members of the organization is essential. The PR expert must ensure a good communication, upwards, downwards, and horizontally.

In regards to the relationship with the community, this has to be a planned activity, performed according to a very detailed strategic plan. This permanent connection with the community has the role of maintaining a common ground between the organization and the community.

Public affairs are actually the definition of a set of public relations activities. They are used mainly by official, government organizations, and their fundamental purpose is to guide and adapt the organization to the public demands and expectations.

Theme management, according to Wilcox et al. (2000, p. 9) is about the identification and direction of the target audience’s concerns that can affect the organizations.

In the case of financial relationships, the public relations expert’s role is to ensure a permanent contact with the investors and the sponsors, in order to maintain and increase their trust, and to promote a good relationship with the financial sector of the community.

Another task of the PR expert is that of contacting new organizations with the same type of activity, in order to maintain a connection between organizations of the same kind for possible collaborations. D. L. Wilcox et al. named them industrial relationships.

The needs of an organization must be made known. The public must be encouraged to support the organization, even through financial contributions, also called fund collections. Multicultural relations are fundamental for the progress of an organization. By knowing multiple cultures and organizational cultures, a progress will be reached in the organization. PR are also responsible for the organization of special events with the public in mind. Through these events (autographs sessions, game demonstrations, etc.), the organization can ensure the permanent loyalty of a public. Through these events and through the direct interaction of the organization with the public, the organization can record better the point of view of the public.

Not in the least, the public relations expert must perform a series of activities meant to sell products, promotional materials, sale exhibitions, products that promote the organization, an activity that can be seen in Fig. 1, as marketing communication. Leddingham and Brunning write that sport public relations are based on two important aspects, relationship management and relationship building (Leddingham & Brunning, 2000, p. 65).

„Sport public relations comprise all processes through which a sports organization can create and develop mutual beneficial relationships with a variety of audiences” (Hopwood, 2005, p. 175).

In their book, „Sport Public Relations: Managing Organizational Communication”, the American authors Stoldt et al., define public relations in sports as follows:

„Sport public relations are a managerial function based on communication, meant to identify key audiences for a sport organization, to evaluate its relationships with those audiences and to adopt desirable relationships between the organization and those audiences” (Stoldt et al., 2006, p. 19).

Material and Methods

The study used the documentation method, to analyze the PR and marketing experts' opinions, and the deductive analysis method and to emphasize the characteristics of each field.

This research started from the following working hypothesis: The parallel study of the concepts of sports PR and sports marketing could lead to the observation of common elements, but especially to the identification of defining elements for each field, thus eliminating confusion in the elaboration of a strategic PR plan.

In order to confirm / infirm the hypothesis we studied the few published papers regarding sports marketing, but also regarding public relations and sports in professional literature, and analysed the opinion of specialists in order to distinguish the common points and differences between the two concepts.

Results

In regards to the concept of marketing, even though sport is selling for centuries, the idea of a rational system of sports marketing is relatively new, but there is also an increasing need to use the modern principles of sports marketing. This paper will define the concept of sports marketing and will emphasize the need for a professional qualification. Next, the sports components will be analyzed as a product and the components of sports industry,
then the numerous traits will be highlighted, which, combined, make sports marketing a unique area of investigation and application.

In 1928, the great American sports promoter, Tex Rickard, observed that the public wanted sports competitions in which the good guys defeated the bad ones. He was a master in intuiting this kind of business. He was one of the architects of the golden age of sports in America. Of course, Rickard was not the first sports promoter. The historian William Baker observed that the roles of athlete, sponsor, spectator and commentator have existed in sports since the early festivals in Ancient Greece. But, if over the last 100 years there was a constant increase of involvement in sports, this means that the sponsors, commentators, and other entrepreneurs have played key roles.

The sports marketing expert is asked to sell a product that is completely unpredictable, inconsistent, and open to subjective interpretation. The sports marketers must perform their role in an extremely competitive market, on a promotional budget that is much smaller than in the organizations of the same size in other fields. Finally, the sports marketing experts must do all these things while they have only a limited control over the product selling process.

The marketers certainly need a rational and coherent system that would bridge the sports consumers and sports as a product. This system can be called "sports marketing". Unfortunately, this concept is used currently much too loosely. The term, "sports marketing", was created by Advertising Age in 1978, to describe "the activities of experts in marketing of industrial and consumer products," who used sports more and more as a promotional vehicle. Even a casual TV watcher can observe how sports images and personalities are used to sell beer, cars and a whole gamut of other products.

This sense of the word is still very limited, because it is not able to recognize the dominant side of sports marketing, which is the marketing of sports products, competitions and services.

Discussions and Conclusions

Encouraging the way people think or feel in regards to a certain organization can be a long, laborious, complicated process, done over the course of large amounts of time, but when there is public relations knowledge within the organization, and when public relations are recognized and well managed and well integrated into a communication function within an organization, it is a well-known fact that public relations can lead to real, measurable benefits.

For a sports organization, PR can be the most economic and productive communication mechanism, if this mechanism is implemented strategically and professionally.

Besides, they say that public relations are more about "what is done" than "what it is". The function of PR in sports is creating a good impression about the organization and what it represents. This can be partially accomplished on one side by creating a good reputation for the organization, and on the other side, by convincing people to have a positive thinking and attitude regarding the organization and its activity.

Another important reason is represented by long term relationships that people develop with their preferred sport. Whether they are fans, participants, or managers, people invest a large amount of time, emotions, money, even sacrificing certain relationships for their love of sports.

In regards to sports marketing, one can say that this sums up all activities meant to satisfy the needs and desires of sports consumers through exchange processes. Sports marketing developed two main branches, marketing for sports products and direct services for sports consumers, and marketing for the other sports promoting consumer and industrial products or services through the use of promoting sports.

The conclusions of this study can be summed up as follows:

Firstly, the working hypothesis has been confirmed, in the sense that the parallel study of the concepts of sports PR and sports marketing have lead to the observation of common elements, but especially to the identification of defining elements for each field, thus eliminating confusion in the elaboration of a strategic PR plan.

Secondly, the unique aspects of sports marketing determines the basic conditions under which the experts have to act. Although none of the factors is determinant in itself, and some of them are not specific to sports, the combination of factors presents the sports marketing experts a truly singular challenge that needs quite a different approach.
References


THE INFLUENCE OF THE AFFECTED SIDE IN THE IMPROVEMENT OF THE STATIC AND DYNAMIC BALANCE IN POST STROKE HEMIPLEGIC PATIENTS

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Abstract. International statistics show that stroke has an annual occurrence of more than 16 million new cases, thus being a global health problem. It is the second death cause worldwide and one of the main causes of severe impairment. Hemiplegia severely affects the individuals’ capability of performing the activities of daily living. It limits their social and professional integration and, as a consequence, their quality of life diminishes dramatically. Stroke is the main cause of falls in adults. Their static and dynamic balance is severely impaired, having a postural balance almost twice as large as that of age matched individuals with no physical impairments. The aim of this paper is to determine whether there is an influence of the affected side on the evolution of the static and dynamic balance in the functional rehabilitation process of post-stroke patients. The 8-weeks experiment was conducted in a hospital in Bucharest, on a group of 28 participants, aged 45-65 years old and diagnosed with ischemic stroke. The results showed that both the static and dynamic balance improved but the influence of the plegic side in their evolution was not statistically significant.

Keywords: stroke; balance; hemiplegia; rehabilitation

Introduction

A characteristic of the nowadays society is the continuously increasing level of stress which affects the human being. The global economic crisis of the latest years has determined a rise of the chronic diseases rates among individuals. According to a study performed at the Carnegie Mellon University in 2012, the human organism is incapable to self regulate under stress, thus the inflammation generated by the harmful stimulus contributes to the occurrence of various diseases (How stress influences disease, 2012).

WHO statistics show that between 60% and 85% of the world’s population has a sedentary lifestyle (Physical inactivity a leading cause of disease and disability, 2002). Most of these individuals are overweight and have multiple chronic diseases such as high blood pressure, dyslipidemia and hypercholesterolemia. These are some of the modifiable risk factors of stroke.

Stroke is the second death cause worldwide after the cardiovascular diseases and it is also one of the main causes of severe impairments (The top 10 causes of death, 2014). In the past 10 years in Europe, more than 1 million deaths have occurred as a result of an acute stroke. These numbers differ according to each geographic region (Nicholset al., 2014, p. 2929). Nevertheless, since 2000, the death rates secondary to a stroke have decreased in most of the European countries. In Estonia and Austria the decline has reached more than 50%, due to the very powerful health policies of these countries (Health at a glance: Europe 2014, 2014). At the opposite, Bulgaria and Lithuania have registered a small decrease of their numbers. Romania is amongst the first 10 European countries regarding the death rates after stroke (Mahon et al., 2013).

Stroke treatment has improved over the years. By the end of the 1990s, in the medical field it was thought that the brain injury was irreversible and the treatment was focused on preventing the secondary complications and on the functional rehabilitation of the survivors. Later, scientists have proven that an early thrombolysis contributes significantly to the increase of the life expectancy after an acute stroke (In-hospital mortality following stroke, 2011). Stroke survivors usually have neural-motor impairments in spite of an optimal therapeutic approach. Most of them are at least partly dependent in performing the activities of daily living which severely affects their quality of life.

In many countries there have been introduced specialized medical units for the early diagnosis and intervention. This lead to an increase of the survival rates compared to the classical medical care. Up to 80% of all strokes can be prevented through specific means of reducing the personal risk (Preventing a stroke, 2015).

Hemiplegic patients have very poor balance skills. Their postural balance is twice as large as that of the healthy individuals at the same age. Also, their ability to distribute weight symmetrical on both legs is diminished. These subjects load between 61% and 80% of their weight on the unaffected leg (Geiger et al., 2001). Stroke is the main cause of falls among adults, generating as much as 25% of all falls (Gavrilă et al., 2009). Following a fall, most of the individuals reduce their functional independence, thus decreasing the quality of their lives. The main objective of physical therapy followinga stroke is the functional rehabilitation of these individuals.

The clinical observations made during the physical therapy sessions often seem to reveal a different evolution of the patients with a left sided hemiplegia compared with the right sided ones. The current research aimed at determining whether the affected side influences balance rehabilitation in post-stroke patients.
Materials and methods

The study was performed in a hospital in Bucharest, from April 2013 to March 2015, on a group of 28 participants aged 45-65 years old. They were diagnosed with less than 1 year old ischemic stroke and each patient was submitted to a 8 week long functional rehabilitation program. The participants were recruited according to various inclusion and exclusion criteria (Table 1).

Table 1. Selection criteria of the research subjects

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Inclusion</th>
<th>Exclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: 45-65 years old</td>
<td></td>
<td>Age below 45 and above 65</td>
</tr>
<tr>
<td>Diagnosis: less than 1 years old ischemic stroke</td>
<td></td>
<td>More than one year old ischemic stroke</td>
</tr>
<tr>
<td>Chronic stroke</td>
<td></td>
<td>Acute stroke</td>
</tr>
<tr>
<td>Risk factors: high blood pressure, ischemic heart disease, type 2 diabetes, hypercholesterolemia, dyslipidemia, sedentary lifestyle, chronic smoking, overweight</td>
<td></td>
<td>Multiple strokes</td>
</tr>
<tr>
<td>The written consent of the subjects to participate in the study</td>
<td></td>
<td>Hemorrhagic stroke</td>
</tr>
<tr>
<td>Active and conscious participation of the subjects within the study</td>
<td></td>
<td>Posttraumatic stroke, stroke secondary to brain tumors</td>
</tr>
</tbody>
</table>

In designing the study we used the following research methods: the bibliographic research, the clinical interview method, the observation method, the experimental method, the statistical analysis, the graphic representation and various functional assessment tools. The statistical analysis was performed in SPSS 17.0 and SPSS 20.0, using “Pair samples T test” and “General Linear Model - Repeated Measures ANOVA”.

The initial and final assessments of the subjects were focused on collecting valuable data regarding:

- The functional independence level (Barthel Index).
- The spasticity level (Modified Ashworth Scale).
- The static and dynamic balance level (Postural Assessment Scale for Stroke).
- Discriminative touch, proprioception and kinesthesia.

These assessment tools are validated according to the European Guide (ESO) for the transient ischemic attack and the ischemic stroke, which was published in the *The Official Journal of Romania* in 2009. The subjects’ heart rate and blood pressure were also monitored within each rehabilitation session.

**Hypothesis**: The affected side has an influence on the evolution of the static and dynamic balance in the functional rehabilitation process of post-stroke patients.

The functional rehabilitation programs were individualized according to the initial assessment results and the following specific objectives:

- Decreasing spasticity.
- Learning transfers.
- Increasing joint mobility.
- Improving static and dynamic balance.
- Improving proprioception, laterality and the body schema.
- Improving stability while performing complex tasks.
- Stimulating impossible movements.
- Improving spontaneous movements.
- Improving gait.

The rehabilitation means were specific (physical exercise, positioning and massage) and non-specific (pain reducing electrotherapy, magneto therapy, ultrasounds and electrical stimulation). In designing the rehabilitation
programs we related to these concepts: Bobath, PNF, Margaret Rood, Integrative Physiotherapy, Spacial Dynamics, Le Mettayer and Perfetti. We have also used the pulley therapy and some elements of mecanotherapy.

Each subject benefitted of 8 weeks of functional physical therapy, with a frequency of 5 sessions per week. Each session lasted between 45 and 60 minutes and the maximum number of exercises per session varied between 8 and 12, in 1-6 series of 2-5 repetitions each. The exertion was aerobic and exercise intensity varied according to each subject’s exercise capacity, thus preventing fatigue. Rest time in between sets varied from 30 to 90 seconds.

Results

The research was conducted on a group of 20 male and 8 female subjects. A review of the literature shows that ischemic stroke and intracerebral hemorrhage are more frequent in males, while the subarachnoid hemorrhage mostly affects women (Appelros et al., 2009). Most of research participants were living in an urban area (68%). According to the literature, this has no influence in stroke occurrence (Grotta et. al., 2015, p. 209). High blood pressure and sedentary lifestyle are the main two risk factors observed in case of the research participants. 64% of the participants have left side impairment and 61% of them do not have a family history of stroke.

As a result of the initial assessments we collected a series of valuable data regarding the static and dynamic balance that we systematized in the tables below.

Table 2. PASS results – initial assessment

| PASS | Subjects | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | S13 | S14 | S15 | S16 | S17 | S18 | S19 | S20 | S21 | S22 | S23 | S24 | S25 | S26 | S27 | S28 |
|------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|      | Maintaining a posture |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|      | Standing with arm support | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
|      | Standing with leg support | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
|      | Standing with arm and leg support | 3 | 3 | 3 | 3 | 0 | 1 | 3 | 1 | 2 | 3 | 1 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
|      | Standing on non-parietal leg | 3 | 2 | 3 | 3 | 0 | 0 | 2 | 3 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 0 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 1 | 3 | 3 |
|      | Standing on parietal leg | 2 | 1 | 2 | 3 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 1 | 0 | 2 | 3 | 0 | 0 | 0 | 2 | 1 | 2 | 1 | 1 | 3 | 0 | 0 | 3 | 3 |
|      | Maintaining a posture lateral | 14 | 12 | 14 | 15 | 4 | 7 | 12 | 15 | 6 | 9 | 9 | 11 | 8 | 13 | 14 | 9 | 8 | 9 | 13 | 12 | 13 | 12 | 15 | 9 | 15 | 9 | 15 | 15 | 15 |
|      | Supine to supine lateral side | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
|      | Supine to non-parietal side | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
|      | Supine to sitting up on the edge of the mat | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
|      | Sitting on the edge of the mat to supine | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 3 | 1 | 2 | 3 | 3 |
|      | Sitting to standing up | 3 | 2 | 3 | 3 | 1 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 3 | 1 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 1 | 3 | 3 | 1 | 2 | 3 | 3 |
|      | Sitting to standing down | 3 | 2 | 3 | 3 | 1 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 3 | 1 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 1 | 3 | 3 | 1 | 2 | 3 | 3 |
|      | Standing picking up a pedal from the floor | 2 | 1 | 2 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 2 | 2 |
|      | Changing a posture lateral | 20 | 15 | 20 | 19 | 11 | 14 | 19 | 14 | 9 | 10 | 14 | 19 | 10 | 14 | 19 | 11 | 19 | 19 | 14 | 14 | 16 | 14 | 16 | 17 | 17 | 11 | 17 | 19 | 14 | 14 | 14 | 15 | 15 | 15 |
The results of the initial and final assessments are analyzed and compared in the following section. Based on this analysis we have drawn the conclusions regarding the importance of the affected side in the evolution of the static and dynamic balance of the participants.

**Discussions and conclusions**

According to the significance tests in table Multivariate Tests in Fig. 1 (p=0.000<0.05), the average values of the static balance increase significantly from 11.21 (initial assessment) to 12.5 (final assessment).

![Table 3. PASS results – final assessment](image)

<table>
<thead>
<tr>
<th>Description</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static balance - initial ass.</td>
<td>11.21</td>
<td>3.071</td>
<td>28</td>
</tr>
<tr>
<td>Static balance - final ass.</td>
<td>12.50</td>
<td>2.442</td>
<td>28</td>
</tr>
</tbody>
</table>

**Fig. 1. The effect of the functional rehabilitation programs on the static balance**

The average values of the dynamic balance have increased significantly from the initial to the final assessment, from 15.71 to 18.43 (p=0.000<0.05).
The final assessment results show a 4 points increase of the total balance, from 26.93 to 30.93 (Fig. 3). The statistical dispersion of the data is relatively homogenous at the initial assessment and homogenous at the final one. According to the Pair samples T test, the means are statistically different (p=0.000 < 0.05).

Correlating total balance results with the affected side it was revealed the following:

• The average values of the participants with right side impairment are lower than those of the left sided ones, but there is a bigger difference from the initial to the final assessment values for the rightsided subjects (Fig. 4).

• In case of the participants with right side impairment, the results are statistically different between the two assessments but there is no influence of the affected side in their evolution. The level of significance t=0.584 > 0.05 indicates different covariance, as shown in table Box’s Test of equality of covariance matrices in Fig. 4.

• The total balance values do not vary according to the affected side, although the results are better for the right side impaired subjects (p=0.450 > 0.05).
Fig. 4. Total balance results in correlation with the affected side

In conclusion, the functional rehabilitation program that we developed determined a significant increase of the static and dynamic balance within the group (Fig. 5) but these results are not statistically correlated with the affected side (p=0.152 > 0.05).

Fig. 5. Diagnosis effect on the evolution of total balance

Based on these results the hypothesis according to which the affected side determines an improvement of the static and dynamic balance of post stroke hemiplegic subjects is rejected. The influence of the side impairment on the evolution of balance is very small - Partial Eta Squared 0.077 < 0.14 (Fig. 5).

In accordance with these findings it cannot be stated that the participants with right side or left side hemiplegia have a better evolution of their static and dynamic balance compared with the others. Post-stroke rehabilitation depends on the amount of damage to the brain, on the skills that the rehabilitation team has and on the timing of the rehabilitation process. The earlier it begins, the more likely survivors are to regain their abilities and skills. Patient and family cooperation are also important thus increasing the chances of successful results.

The functional rehabilitation programs designed for the current research improved the subjects’ balance, but the results were independent of the affected side.

References


THE EFFECTS OF PSYCHOTHERAPY IN GUIDED RECOVERY IN BASKETBALL

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Abstract. One of the main problems of modern sport is the subsequent recovery, a practical way of optimising training in order to sustain the performance and preserve the biological health of the athlete. In modern basketball, basic motor abilities specifically requested are coordination, speed and strength-speed. Moreover, any basketball game involves complex mental strategies such as intellectual, volitional, emotional and psychosocial ones. In accordance to specific requirements of the basketball game, the main directions of recovery post match are aimed in particular to functional tasks such as neuro-psychiatric, metabolic and neuromuscular ones. The hypothesis of this research was the realization that the use of systematic and organized recovery techniques specific to the basketball game in junior II, results in an efficient recovery, reflected through an optimisation of individual recovery indexes. The research was conducted during the 2015-2016 competitive period between two groups of junior basketball II (experimental and control group). Both groups have worked in accordance with game plans developed by their coaches after liaising with federal specialist regulations. For the experimental group, specific means of recovery used were Schultz autogenous training and stretching. Tests used to assess the body’s post effort recovery were the clino-orthostatic reflex index (IRCOS), miotonometry and the Dorgo recovery index. In conclusion, we are able to confirm the hypothesis that a systematic use of specifically chosen recovery methods designed for the basketball game leads to an improvement of the tested index values, a fact which can be clearly seen within the experimental group.

Keywords: recovery, basketball, Schultz autogenous training, stretching, IRCOS, dorgo index, miotonometry

Introduction

Modern performance sport implies raising the number of trainings and, implicitly, shortening the recovery duration post-effort, which leads to the necessity of using some directed recovery means. The more these means are elected based on the characteristics of the specific effort, the more their beneficial effects will be obvious (Agenţia Naţională pentru Sport, 2005, 2003).

In modern basketball, in which the play rhythm is very alert, the effort is mixed, predominantly anaerobic lactacid, with a proportion of 60-90% for competitive effort. Basic motor abilities specifically requested are coordination, speed and strength-speed. Moreover, any basketball game involves complex mental strategies such as intellectual, volitional, emotional and psychosocial ones. Therefore, the specific effort used in basketball involves intense request of the central nervous system, a good neuro-muscular coordination and a fast reaction speed, the result of a compensated cortical hyperexcitability (Bota, 2002).

For the U16 category, among the specific requests of the sport adds the physiological and neuro-pshyhical modifications, typical to the pubertal period. Because of the biological discomfort, the teenager is characterized with irritable behavior, relatively conflictual, states of extreme shyness or exuberance, capricious moods which develop based on a fluctuating independent fund.

Considering the specific requirements of the basketball game and the characteristics of the puberty age, the main pronged approach of the recovery addresses mainly to the functional requests of neuro-pshyhyc type, neuromuscular type and metabolical type, the main methods used being the psychotherapy and those that address to the neuro-muscular system (Drăgan, 2002).

Hypothesis. Systematic and organized use of recovery strategies, specific to the requests of the game play for the U16 category, facilitates an efficient recovery, materialized by optimizing individual recovery indexes and by increasing team performance.

Materials and methods

The research was conducted on two groups of U16 basketball players, legitimated under S.C. Slam Bucharest (the experimental group) and Steaua Magic (the control group), in the location where these groups held their trainings, respectively the sports hall of Spiruharet National College. The two groups were formed out of twelve players and they held their activities according to the training plans elaborated by their coaches in accordance with the federation’s regulations. The groups were similar when it came to age and experience in practicing this sport. Therefore, the average age of the athletes from the experimental group is 15.3 years old and the one for the control group is 15.8 years old, whilst the average experience in practicing basketball is 2 years and 5 months for the experimental group and 2 years and 3 months for the control group.
For the experimental group, the methods used were the autogen Shultz training and stretching. The effects of these post-effort recovery strategies had regarding the organism were assessed by calculating the clino-ortostatic reflex index, miotonometry and calculating the Dorgo recovery index. During the experiment, there were seven determinations taken.

The obtained results have been processed statistically and mathematically, using parameters that allow a complex analysis of the recordings. The statistical parameters used were the arithmetic mean, standard deviation (quadratic average deviation), median, modul (dominant), variant and the inferior and superior limit (minimum and maximum) of the value series.

The statistical processing of the data used comparison methods of the average values of the obtained parameters from the two groups studied – the ANOVA calculus method for establishing the existence of significant statistical differences between the recorded values. The considered significant statistical difference is for \( p < 0.05 \)

**Results**

The clino-ortostatic reflex, significant for the evaluation of the cardiovascular neurovegetative response, was evaluated by ECG recording. After A. Gagea, the relevant parameter of the clino-ortostatic reflex is the relative dynamic deviation (K) or the RCOS index:

\[
K = \left( \frac{FC_2 - FC_1}{FC_3} \right)
\]

where: FC1 is the cardiac frequency in clinostatism, FC2 is the maximum cardiac frequency immediately in ortostatism and FC3 is the cardiac frequency stabilized in orthostatism, at circa 40-50 seconds after the change in position.

**GOOD VALUES**

About 0.200

**UNADAPTED VALUES**

About 0.300

**UNECONOMIC VALUES**

About 0.400

The recordings for the RCOS index at the 7 evaluations show an initial average of unadapted values at both groups, respectively 0.297 for the control group and 0.302 for the experimental group. The results have registered obvious improvements at the next evaluations, reaching 0.178 for the control group and 0.149 for the experimental group at the very last evaluation (good values) (table 1).

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC</td>
<td>0.297</td>
<td>0.302</td>
<td>0.230</td>
<td>0.242</td>
<td>0.184</td>
<td>0.241</td>
<td>0.172</td>
</tr>
<tr>
<td>LE</td>
<td>0.024</td>
<td>0.020</td>
<td>0.029</td>
<td>0.018</td>
<td>0.018</td>
<td>0.020</td>
<td>0.016</td>
</tr>
<tr>
<td>Median</td>
<td>0.309</td>
<td>0.285</td>
<td>0.225</td>
<td>0.250</td>
<td>0.154</td>
<td>0.250</td>
<td>0.142</td>
</tr>
<tr>
<td>Mod.</td>
<td>0.285</td>
<td>0.285</td>
<td>0.142</td>
<td>0.25</td>
<td>0.142</td>
<td>0.142</td>
<td>0.25</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>0.084</td>
<td>0.070</td>
<td>0.099</td>
<td>0.064</td>
<td>0.062</td>
<td>0.069</td>
<td>0.054</td>
</tr>
<tr>
<td>Min.</td>
<td>0.142</td>
<td>0.142</td>
<td>0.125</td>
<td>0.142</td>
<td>0.142</td>
<td>0.142</td>
<td>0.142</td>
</tr>
<tr>
<td>Max.</td>
<td>0.428</td>
<td>0.428</td>
<td>0.428</td>
<td>0.333</td>
<td>0.285</td>
<td>0.333</td>
<td>0.285</td>
</tr>
</tbody>
</table>

A significant statistical difference is found between the average values obtained at the testing, at a value of \( p < 0.05 \), at both groups. For the experimental group, the differences were found in all cases. Therefore, the results entitle us to appreciate that the recovery program applied to the experimental group lead to the improvement of the post-effort recovery of the athletes.
Miotonometry, a direct measuring method for the muscular tone, appreciates the functional state and the recovery capacity of the muscular fibre. The relaxation and the contractions values are measured, the efficiency of the contraction resulting from the difference between those two values. A difference of 30 Uz for girls and 40 Uz for boys demonstrates an efficient contractual capacity.

The recordings of the rest muscular tone at the seven evaluations show average values which are in between normal limits, the positive evolution of the values being more obvious in the experimental group. The average values for the control group were 70.7 Uz for the initial testing then 72 Uz for the final testing, whilst for the experimental group the values were in between 70.7 Uz (initial testing) and 68.7 (final testing), see Table 2.

Table 2. The evolution of the resting muscular tone values for the two groups

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LC</td>
<td>LE</td>
<td>LC</td>
<td>LE</td>
<td>LC</td>
<td>LE</td>
<td>LC</td>
</tr>
<tr>
<td>Average</td>
<td>70.7</td>
<td>70.7</td>
<td>71.5</td>
<td>71.5</td>
<td>71.3</td>
<td>70.3</td>
<td>69.5</td>
</tr>
<tr>
<td>Average error</td>
<td>0.62</td>
<td>0.62</td>
<td>0.44</td>
<td>0.44</td>
<td>0.36</td>
<td>0.36</td>
<td>0.58</td>
</tr>
<tr>
<td>Median</td>
<td>70</td>
<td>70</td>
<td>72</td>
<td>72</td>
<td>71</td>
<td>70</td>
<td>72</td>
</tr>
<tr>
<td>Modul</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>72</td>
<td>70</td>
<td>72</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>2.15</td>
<td>2.15</td>
<td>1.51</td>
<td>1.51</td>
<td>1.24</td>
<td>1.24</td>
<td>2.02</td>
</tr>
<tr>
<td>Minim.</td>
<td>68</td>
<td>68</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>68</td>
<td>70</td>
</tr>
<tr>
<td>Maxim.</td>
<td>74</td>
<td>74</td>
<td>74</td>
<td>74</td>
<td>74</td>
<td>75</td>
<td>72</td>
</tr>
</tbody>
</table>

A significant statistical difference is found between the average values obtained at the testing, at a value of \( p < 0.05 \), at both groups, for the control group only in one case, for the experimental group in three cases.
From what is observed, the average values of the resting muscular tone improve for both groups, more obvious for the experimental group.

For the contraction muscular tone, the average values were between 89.42 Uz (initial testing) and 87.42 Uz (final testing) for the control group and 90.33 Uz (initial testing) and 95.58 Uz (final testing) for the experimental group. (Table 3).

Table 3. Evolution of the contraction muscular tone values for both groups

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC</td>
<td>89.42</td>
<td>90.33</td>
<td>90.42</td>
<td>91.67</td>
<td>88.50</td>
<td>92.58</td>
<td>90.42</td>
</tr>
<tr>
<td>LE</td>
<td>90</td>
<td>90</td>
<td>91</td>
<td>88</td>
<td>92</td>
<td>89.5</td>
<td>93.5</td>
</tr>
<tr>
<td>Average</td>
<td>0.50</td>
<td>0.69</td>
<td>0.42</td>
<td>0.54</td>
<td>0.42</td>
<td>0.72</td>
<td>0.51</td>
</tr>
<tr>
<td>Average error</td>
<td>0.42</td>
<td>0.72</td>
<td>0.51</td>
<td>0.74</td>
<td>0.36</td>
<td>0.62</td>
<td>0.34</td>
</tr>
<tr>
<td>Median</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>88</td>
<td>94</td>
</tr>
<tr>
<td>Modul</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>88</td>
<td>94</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.73</td>
<td>2.39</td>
<td>1.44</td>
<td>1.87</td>
<td>1.45</td>
<td>2.50</td>
<td>1.76</td>
</tr>
<tr>
<td>Minim.</td>
<td>86</td>
<td>86</td>
<td>87</td>
<td>90</td>
<td>86</td>
<td>88</td>
<td>86</td>
</tr>
<tr>
<td>Maxim.</td>
<td>92</td>
<td>94</td>
<td>92</td>
<td>94</td>
<td>90</td>
<td>98</td>
<td>90</td>
</tr>
</tbody>
</table>

For the control group, there were significant statistical differences between the average values obtained at the contraction muscular tone in two situations, whilst for the experimental group there were differences in four situations.
Fig. 3. Comparative evolution of the contraction muscular tone values for both groups

From what is observed, the average values of the contraction muscular tone improve from the initial testing to the final testing, for the experimental group, but a decrease of the values for the control group which might suggest the setting of fatigue, therefore a poor post-effort recovery.

The Dorgo recovery index is calculated with the following formula:

\[
\frac{(P1 + P2 + P3 + P4) - 300}{10}
\]

where: 
P1 – the rest pulse, measured with 15 seconds before the effort  
P2 – the pulse measured at the first 15 seconds after 1 minute of effort  
P3 – the pulse measured at the first 15 seconds after 3 minutes of effort  
P4 – the pulse measured at the first 15 seconds after 5 minutes of effort

<table>
<thead>
<tr>
<th>Mark</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very good</td>
<td>- 10 - 5</td>
</tr>
<tr>
<td>good</td>
<td>- 5 - 0</td>
</tr>
<tr>
<td>average</td>
<td>0 - 5</td>
</tr>
<tr>
<td>satisfying</td>
<td>5 - 10</td>
</tr>
<tr>
<td>unsatisfying</td>
<td>&gt;10</td>
</tr>
</tbody>
</table>

The average values obtained for the Dorgo index were “good” at every testing for the control group, between 4.62 at the initial testing and 2.73 at the final testing, whilst for the experimental group, they varied between 2.20 at the initial testing and 1.15 at the final testing, being between the marks “average” and “good”. These values indicate a faster comeback after effort and a better physical training towards the end of the period for the experimental group.

Table 4. Evolution of the Dorgo recovery index values for the two groups

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>LC</td>
<td>LE</td>
<td>LC</td>
<td>LE</td>
<td>3.23</td>
<td>LE</td>
<td>LE</td>
</tr>
<tr>
<td>Average</td>
<td>4.62</td>
<td>2.20</td>
<td>3.83</td>
<td>1.35</td>
<td>4.08</td>
<td>1.43</td>
<td>0.30</td>
</tr>
<tr>
<td>Average error</td>
<td>0.38</td>
<td>0.25</td>
<td>0.29</td>
<td>0.20</td>
<td>0.27</td>
<td>0.18</td>
<td>3.2</td>
</tr>
<tr>
<td>Median</td>
<td>4.8</td>
<td>1.80</td>
<td>4.1</td>
<td>1.20</td>
<td>4.3</td>
<td>1.30</td>
<td>3.2</td>
</tr>
</tbody>
</table>
Significant statistical differences were recorded between the average values obtained at the calculation of the Dorgo recovery index in almost every situation.

It is easily observed that the difference between the values of the initial testing and the final testing are bigger for the experimental group than the control group. Therefore, you can say that the recovery program was well applied, producing results in the experimental group.

Discussions and conclusions

By comparative tracking of some functional and recovery parameters with two groups of U16 basketball players legitimated at two Bucharest sport clubs, we present the following conclusions:

- The IRCOS average value evolution shows a obvious improvement at the end of the testing period compared to the initial period, more obvious at the experimental group which indicates improvement of the neurovegetative adaptation of the cardiovascular system. These results confirm on one side the positive influence of the systematic physical effort over the dimensional changes adapted functionally to the cardiovascular system, and on another hand the role of an optimum post-effort recovery.

- The evolution of the muscular tone parameter, the one that depends the most on the neuro-psychic component, recorded an improvement of the average values at the experimental group, which confirms the usefulness of using psychotherapy methods in the recovery of basketball players.

- Regarding the evolution on the Dorgo recovery index, the tendency of the average values to decrease is distinguished for both groups, more obvious for the experimental group which gets better marks, from “average” in the beginning, to “good” in the end, whereas the control group goes from “satisfying” to “average”.

- The obtained results confirm the hypothesis of the research, demonstrating that the systematic use of some specific recovery methods has positive influence over the organism.

References


STUDY ON THE IMPROVEMENT OF EXPLOSIVE STRENGTH IN CHILDREN AGED 10-11 YEARS USING THE JUMP TRAINING

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Abstract. The development of explosive strength represents a major objective in the athletic training of children, from here deriving the jump training impact on the degree of improvement of this motor quality. Some research in the field proves that the value of strength growth is higher in the tests involving a movement closer to the exercises used during training. For example, if the training is a typical dynamic one, the strength gain will have better values in the tests involving the same type of (dynamic) effort than in those involving isometric contractions. The purpose of our experiment was to highlight the degree of improvement of explosive strength in children aged 10-11 years by means of the jump training applied for 12 weeks, with a frequency of 2 times/week. The experiment was carried out within the lessons of physical education at the Middle School no. 133. Analysing the results of this experiment, we can conclude that the jump training sessions contribute to the development of explosive strength even after a relatively short training period.

Keywords: motor qualities; children; explosive strength; training.

Introduction

Physical education is an essential value for the human being, and motor activity has the most important social impact, because it represents a way to transmit from one generation to another the cultural elements, the values, attitudes and beliefs it creates. Therefore, physical education becomes in this context the bridge between to be and to become, which facilitates the exteriorization of the bio-psychomotor and social potential of the human being.

In addition to the significant influences it has on the human physical fitness, physical education has special importance within global education, because the effects of this education are reflected in all the sides of human personality, such as the intellectual, emotional, volitional, aesthetic, moral ones. All forms of physical activity are meant to lead to achieving results in competitions of any type.

Physical education bears the imprint of a cross-curricular dimension, due to its contribution to the plenary development of the autonomous and creative personality of children.

“Multilateral physical development of children represents the foundation of sports training, based on this general development they being able to improve their sports performance more quickly and better than when deprived from this foundation” (Bompa, 2002, p. 5).

The concept of “early sports training” aims at observing three tasks:

• to guarantee that the long-term performance training is initiated appropriately and is carried out multilaterally but specifically, according to the practiced sports branch;
• to discover the talented elements and to promote them;
• to orient the performance objectives according to the characteristics of exercise capacity the children have at these ages.

The importance of strength training in childhood results from the following grounds:

• According to the statistic made by Dordel (cited in Weineck, 1997, p. 275), 50-65% of children have a poorly developed muscle system because of the lack of movement;
• At the age of 6-9 years, postural deficiencies increase by around 70%, that is why an intervention is justified as regards the muscle strengthening in young children;
• Also in the first school years, the obesity growth rate exceeds 20%, which involves inevitably a decrease in the motor performance during strength, speed and endurance exercises, from here the imperative to train the strength of children;
• With the strengthening of muscle system, the motor behaviour is also improved through the increase of dynamism and precision of movements.

Some research in the field proves that the value of strength growth is higher in the tests involving a movement closer to the exercises used during training. For example, if the training is a typical dynamic one, the strength gain will have better values in the tests involving the same type of (dynamic) effort than in those involving isometric contractions.
**Purpose of the study.** The purpose of our experiment was to highlight the degree of improvement of explosive strength in children aged 10-11 years by means of the jump training applied for 12 weeks, with a frequency of 2 times/week.

**Hypothesis.** The training sessions involving jumps will lead to the improvement of tension release for children participating in the physical education classes, after a period of 12 weeks.

**Materials and methods**

The experiment was performed on a group of 30 children, participants in the lesson of physical education and sports within the Middle School no. 133 of Bucharest. The jump training had a length of 20-25 minutes per lesson and consisted of the following types of jumps, performed in 3 series per lesson:

- Jump rope exercises on both feet for 30 seconds;
- From standing position with the left shoulder towards the gymnastics bench, with the kneeed left foot resting on the bench, jumps with alternating foot change, landing on both sides of the bench, for 30 seconds;
- Semi-squats with hand holding the partner, for 20 seconds.

It was used this type of training (only jumps) because, by its load, it must compensate for the lack of movement of children, who are not athletes, but mere participants in the physical education and sports classes; moreover, the rope handling was poor during exercise, which resulted in a low number of jumps within the 30 seconds; in achieving the programme, it was used the frontal method, which provided sufficient time to allow the recovery of children’s body after exercise.

The research methods used were:

- Statistical Package for Social Science (SPSS), t-Test
- Motor tests: vertical jump: the test consists in performing a maximal vertical jump, starting from a knee flexion position of 90°; the subject must jump with the arm lifted, the jump height being measured between the point marked by arm lifting before the jump and the highest point marked during the test (jump). Two attempts are allowed and the best result is recorded; the landing place will be identical to the initial start position, otherwise the test is not considered correct.

Objective: the evaluation of maximal anaerobic alactacid power by measuring the released tension.

**Results**

Table 1 shows the statistically processed results for the initial and final testing and table 2 shows the statistical processing for the t-test.

<table>
<thead>
<tr>
<th>Testing</th>
<th>Mean</th>
<th>Median</th>
<th>Std. deviation</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Amplitude</th>
<th>Coefficient of variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>25.80</td>
<td>24.00</td>
<td>5.64</td>
<td>17.00</td>
<td>40.00</td>
<td>23.00</td>
<td>21.8%</td>
</tr>
<tr>
<td>Final</td>
<td>28.23</td>
<td>27.00</td>
<td>6.67</td>
<td>18.00</td>
<td>45.00</td>
<td>27.00</td>
<td>23.6%</td>
</tr>
</tbody>
</table>

Table 2. Dependent t-test for paired samples

<table>
<thead>
<tr>
<th>Indicators Differences</th>
<th>Mean</th>
<th>Std. deviation</th>
<th>95% Confidence interval</th>
<th>t</th>
<th>df</th>
<th>Sig. (P)</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.43</td>
<td>1.52</td>
<td>1.89</td>
<td>2.98</td>
<td>8.74</td>
<td>&lt; 0.001</td>
<td>1.60</td>
</tr>
</tbody>
</table>

The vertical jump increased on average by 2.43 cm (9.4%), from a mean value equal to 25.80 cm in the initial test to 28.23 cm in the final test. In 95% of cases, the difference of averages is comprised within the confidence
The increase by 2.43 cm in the final test reached, by significance threshold, the values p < 0.001 < 0.05 for t = 8.74 and the df = 29. The effect size index (1.60) shows that this difference is from high to very high. In both tests, the dispersion of data is relatively homogenous.

The null hypothesis is rejected, and it is accepted the research hypothesis, according to which the average increase in the vertical jump is statistically significant. The graph of average values corresponding to the two tests is presented in Fig. 1.

Discussions and conclusions

The study conducted by Keiner et al. (2013) indicates that strength training leads to the improvement of athletic performance, it also being used for rehabilitation and injury prevention for children aged up to 12 years.

Weltman et al. (1986, cited in Van Praagh, 2008, p. 83) obtained an increase in the dynamic strength of 10% in pre-puberty children after a strength training of 14 weeks, and Hakkinen et al. (1989, cited in Van Praagh, 2008, p. 83), an increase of 15%, assessed by the vertical jump, in pre-puberty children after a strength training of 1 year.

Duchateau (1998, cited in Van Praagh, 2008, p. 83) carried out a survey comparing the effects of a 10-minute jump training, with a frequency of 3 times/week, for 6 weeks, in pre-puberty and post-puberty children; the author indicated an improved vertical jump, before and after puberty, by 24.9% and 31.8% in girls, and by 10.5% and 15.1% in boys.

Within our experiment, there were recorded statistically significant differences between tests, in the case of vertical jump indices.

The novelty of the study is that, even at the pre-pubertal age, it is possible to act for the improvement of explosive strength, which is statistically confirmed by the obtained results, and the training method chosen can represent a landmark for the young people joining the branch of sports trainers. Therefore, we can conclude that an improvement of explosive strength is possible in children of 10-11 years old, if the intervention uses appropriate stimuli, even after a relatively short training period.

References


MODERN METHODS OF FUNCTIONAL REHABILITATION AFTER ISCHEMIC-TYPE STROKE

Sergiu MITROI, Mariana CORDUN

Introduction

Rehabilitation technologies to improve motor control after neurologic injury have undergone tremendous growth during the past 20 years. Rehabilitation technologies can provide quantifiable and repeatable treatment interventions and allow us to better measure the impact of our interventions on impairments of motor function. For example, robotic devices can quantitatively measure changes in motor functions during stroke rehabilitation by gathering kinematic and kinetic data related to variables such as speed and accuracy of task completion, smoothness of reach, or forces exerted during training.

These technologies are not expected to replace occupational or physical therapists, but they will become part of their treatment arsenal to optimize functional performance after a disabling event. Proponents of rehabilitation technologies predict that these tools will help to reduce or control rehabilitation costs by providing intensive movement therapies with minimal supervision by a therapist. This is important at a time when patients receive less therapy after neurologic injuries, such as stroke, despite research evidence that more therapy is better. Evidence that intensive robot-assisted therapy may accelerate the rate of motor recovery after stroke suggests that the use of this technology may help to shorten inpatient hospitalizations and potentially improve long-term functional outcomes (Davenne & Le Breton, 2010, p. 61; Gillen, 2011, p. 280).

The current level reflected in the literature

Theories guiding technology development

Rehabilitation technology is a relatively new and growing field, experiencing some of the same developmental challenges seen during the history of conventional rehabilitation practice. Its development has been strongly influenced by motor learning principles, in particular massed practice and explicit learning paradigms. For example, rehabilitation robotics are designed to produce highly intensive upper limb training that is quantifiable, easily graded, cognitively challenging and goal-directed. Motor learning principles guide their delivery of feedback with regard to knowledge of performance (e.g., via haptics), and knowledge of results, by way of graphs, changes in the virtual tasks and environment and other forms of feedback. To date, most robotic therapy trials have focused on improving motor performance at the International Classification of Functioning, Disability and Health (ICF) level aimed at impairments of body structures and functions, rather than the activity level, aimed at task execution and functional performance. The state of robotic development has dictated this focus, as robots used in clinical trials have primarily exercised the paretic shoulder and elbow during reaching movements while the wrist and hand are supported by the device. Motor learning approaches to conventional stroke rehabilitation have evolved to emphasize task-oriented training to improve upper limb function and patient participation in valued roles and routines. This task-oriented approach, in which motor skills are practiced in natural contexts, has resulted in faster and better treatment outcomes than traditional methods, such as Bobath’s neurodevelopmental therapy. Recent trials of robot-assisted therapies have incorporated a task-oriented training approach in conjunction with other motor learning principles. For example, the Haptic Master and HOWARD robots can provide task-oriented upper limb training during repetitive therapy tasks with either virtual or real objects (Gillen, 2011, p. 281).
Methods used in the process of functional rehabilitation after ischemic-type stroke

A. Kinetotherapy. In the process of rehabilitating the patient with stroke-type sequelae, the fundamental issue is represented by kinetotherapy, through its specific means: physical exercise, positioning, occupational therapy, massage, which can be complemented, as appropriate, by non-specific means, such as: natural physical agents (thermotherapy, hydro-thermotherapy), artificial ones (electrotherapy), mental means (external regulation - counselling, self-regulation, relaxation).

B. Methods using constraint-induced therapy

Taub’s method

More recent neurophysiological findings (the research made by Taub and Knapp) have contributed to enriching the rehabilitative therapeutic arsenal of people with locomotor deficit. The two researchers, Taub and Knapp, have demonstrated that the non-use (of a limb) induced by paralysis generates a non-use phenomenon, which hinders or limits neuromotor recovery.

According to this theory, desafferentation of neural circuits leads to inappropriate adaptation of the affected upper limb, dependent on cortical and subcortical motor circuits. Thus, brain injury is the source of decreased motor activity in the central nervous system. The patient makes ineffective attempts to move, which entails negative facilitation, which is in its turn at the origin of a behavioural “repression” and “masking” of capabilities, which in their turn cause the non-use phenomenon. In parallel, diminished movements entail a diminution of cortical representations of these movements (Davenne & Le Breton, 2010, p. 65).

Starting from this, Taub’s method proposes to immobilise the healthy upper limb and associate this immobilisation with intensive re-education of the parietic upper limb.

The objective of this technique is to reverse the non-use learning and facilitate the movement-dependent cortical reorganization.

Within the Taub’s method protocol, patients must practice this constraint-induced therapy during the entire wakeful period.

In conclusion, the constraint-induced therapy involves three elements:

- intensive training of the affected upper limb;
- techniques allowing the transfer of therapeutic gains into daily life;
- restricted motor activity of the healthy upper limb during the entire period of the day.

C. Methods using re-education through robotic devices

Robotic systems used in neuro-rehabilitation are also called cooperation or co-manipulation systems, due to the physical contact between the robot and the human subject. In re-education, robots are aimed at providing therapeutic assistance, they helping to increase the duration of exercises, particularly their variety and quality.

The exoskeletons are mostly used. These robotic devices, which reproduce exactly the human skeleton, are worn by the patient and fastened with special bonds.

There are three main possibilities that can be used:

- by improving strength, when a too heavy resistance must be manipulated; in that moment, the robot manages the effort;
- by haptic (tactile) function, when the exoskeleton provides the operator with sensory information about the controlled movement;
- by motor re-education, in which case the exoskeleton attached to the hemiplegic patient compensates for the lack of strength and precision in performing tasks compatible with the activities of daily living.

Some of the most used exoskeletons are:

- Mit Manus (In Motion 2 Robot) is a device with two degrees of freedom for the shoulder and elbow joints. Its arm works in the horizontal plane exerting mechanical tensions on the patient, tolerates the defective movements, while the force and position sensors record the movement path and the force applied by the patient (Gillen, 2011, p. 296; Stein & Harvey, 2009, p. 562).

During therapy, the patient is connected to the robot, and the paretic forearm is positioned on a special adjustable support. Therapy involves reaching a directed, repetitive goal by fulfilling tasks that involve the motions of shoulder and elbow. While the patient tries to move the robot’s arm towards the established point, the
computer screen provides him/her with visual feedback on the target location, but also on the motion of robot’s handle.

The MIT-MANUS robot has a control system which is very permissive as regards interaction with the subject’s forearm, similar to the “hand over hand” technique between the therapist and the patient during passive, passive-active and active-passive mobilisations. Although the device is able to provide passive, active-passive and active-resistive mobilisations, most studies on this robot have investigated only the effects induced by active-passive movements on the neuromotor recovery of stroke patients.

The software of this device, used in recent studies, allows the robot to adjust its arm’s travel while performing the motion.

- T-WREX and ARMEO variant, the commercial version of T-WREX (Therapy-Wilmington Robotic Exoskeleton)

The system is made up of a mechanised orthosis that mobilises passively the paretic upper limb of the patient, its mode of operation being based on a concept of construction belonging to another device that has been used for people with muscular dystrophy. Equipped with easily adjustable elastic straps, the device provides the possibility to support the patient’s forearm so that he/she can move actively to increase mobility. T-WREX allows performing movements as naturally as possible, exceeding more than two-thirds of the normal space of movement, the patient being engaged in fulfilling various virtual tasks, such as to move food products from a shelf in a shopping basket etc. The device is also equipped with special sensors able to detect the parameters of forearm and hand motions, providing the patient with very good feedback which enables the gradual correction of motions, and thus he/she understands the own stage of progression through an increasingly better interaction with the virtual environment (Gillen, 2011, p. 298).

- ARMmin is a new anthropomorphic orthosis-type robot, constructed to repetitively perform goal-oriented tasks. It possesses an exoskeletal structure with six degrees of freedom. Being equipped with purposely designed software, the robot allows controlling one’s movements and provides assistance only if necessary. The orthosis incorporates a number of mechanical adjustments allowing adaptation to various morphologies. This robot has several control modes. There is a passive mode, movement therapy, where the robot “lets itself” manipulated, like the patient’s arm when the therapist mobilises it. After a short learning time, the robot becomes able to repeat the movement path. The second mode, game therapy, is an active-assisted mode, where the patient performs, aided by the robot, various movements integrated into a context determined by the themes of those games, displayed on a screen. There is also a third mode, ADL training, for carrying out activities of daily living (Gillen, 2011, p. 298).

- ARM-Guide (Assisted Rehabilitation and Measurement Guide) is a robot with three degrees of freedom, designed to mechanically assist the upper limb in different sectors of mobility. The system consists of a sleeve mounted on a motorized linear rail, which helps the patient during movement. This rail is connected to a system which allows movement variations in all three spatial planes. Being attached to the subject’s hand, ARM-Guide assists the patient’s movement or puts resistance against it, also measuring the force produced by the patient (Gillen, 2011, p. 297).

The patient is required to initiate movements with the affected limb, while the robot assists the moves when the subject cannot maintain the intended path. Statically, the robot is counter-balanced, meaning that the gravitational force decreases during movement, which allows a small margin of error before the robot starts assisting the movement. The limb moves in different zones of the working area. The “targets” that must be reached can be placed to the limit of the limb stretching capabilities, with elbow extended and shoulder flexed as much as possible, but without pain.

- BI-MANU-TRACK

Several studies have highlighted the effects of repetitive movements, performed bilaterally, on the motor recovery of upper limbs. Research has shown that they can have a facilitating effect on the paretic limb by exercising the function of non-affected upper limb, because movements performed with it stimulate the corticospinal projections on the side of the affected limb (Gillen, 2011, p. 300).

BI-MANU-TRACK allows performing pronation-supination and flexion-extension motions in the wrist joint for both upper limbs. Exercises can be performed passively or actively and resistance for isometric contraction can be used at the beginning of the exercise, being based on the patient’s ability level.
Conclusions

Regarding the constraint-induced therapy (Taub’s method), it improves simultaneously the motor and functional performances of patients who underuse their upper limb after stroke. The condition for this method to be applied is that the patients show sufficient motricity in the limb.

As to the rehabilitation through robotic devices, the way in which the robot is controlled by the user is essential, highlighting the human-machine interface. Because it is necessary to control simultaneously the forearm position and the closing/opening of digital-palmar crease, the main disadvantage of this type of control is that it requires the user to focus intensely and the task to be performed takes much time. The adjustment period may last about 8 weeks (Davenne & Le Breton, 2010, p. 61).

References


MOBILITY DEPENDENCE OF CHILDREN FROM 1ST TO 4TH GRADE IN PORTUGUESE SCHOOLS

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Abstract. The mobility dependence appears to be associated with less autonomy in children who spend less time playing alone or being with friends in playful situations. Our intention is to study the dependence of mobility of children in the 1st cycle of education in an urban environment with ages between 6 and 12 years old. The sample consisted of 186 children of both genders of which 95 were female and 91 were male. A multiple response questionnaire was used, and the statistical analysis used was descriptive frequency, crosstabs and inferential analysis. Children who practiced more physical activity are those in the 2nd grade: 70.8% (34), below these are the 3rd grade: 67.9% (36), with the 4th grade having 64.8% (35) and finally the 1st grade with 58.1% (18). In total 66.1% (123) engaged in physical activity and 33.9% (63) did not exercise in any sports club or municipal facilities. We have come to some conclusions, with regards to school transportation, almost all students are moving with motorized transportation where the majority cannot go out without family going with them to any activity, and we have also concluded that the female gender is more active than the males.

Keywords: mobility dependence; physical activity, 1st cycle of education.

Introduction

The reduction of independent mobility, also appears associated with a lower autonomy of mobility. Because of life routines, autonomy and youth mobility in an urban context, children spend less time on the street either alone (home - school) or accompanied by friends in playful situations. There is a direct relationship between the autonomy of mobility and cognitive representation of the child's physical space, playing, physical activity and social relations (Neto, 1999; 2004). The daily lives of young people today are very schematic, turning to electronic video games, television, and computer games (Piéron, 1998; Vasconcelos &Maia, 2001). Young people have sedentary lifestyles, but it is up to society to stimulate and diversify physical activity (Cosco, 2006) for a better social, emotional and cognitive development. Physical activity is important to achieve a healthy lifestyle, it is increasingly clear that it benefits both individual health and public health (Ott et al., 2000; Schaalma et al., 2000).

Regarding mobility and gender, several studies indicate that male children are more active than the female, enjoying greater autonomy and freedom to play more in open spaces (Granville et al., 2002; Rissoto & Tonucci, 2002; O’Brien, 2003; Kyutta, 2004).

According to mobility and age studies, as the child grows, it also increases the operating limit in relation to home, public spaces and places that are beyond the family border (Christensen & O’Brien, 2003). When they become older, children become not only more mobile by themselves, but also more independent emotionally and socially, experiences with the environment in children and young people, reflect the attitudes and values of their families and the social and cultural background in which they operate (Nordstrom et al., 2002).

The street is the central space of separation between childhood and puberty / youth; it is in this space that the child adjusts their own growth.

Materials and methods

The main objective was to analyze the dependence of children of the 1st cycle of basic education in terms of mobility for the practice of physical activity. We used a descriptive study in order to describe how children play daily, as well as their dependence on mobility and what kind of “freedom” they have to go and play in the street with friends. We had a sample of 183 children of both genders (90/ 49.2% male) (93 / 50.8% female), 10.2% (19) were 6 years of age; 20.4% (38) were 7 years old; 26.9% (50) were 8 years old; 23.7% (44) were 9 years old; 15.6% (29) 10 years of age; 1.1% (2) 11 years of age and 0.5% (1) 12 years of age. A direct questionnaire with multiple choice questions was applied based on Correia (2006). Students who practice physical activity (66.1%); Students of the 2nd grade are the ones who ride bicycles more (93.8%), mostly with their families (52.3%).
Students travelled to school mostly by car (73.3%) and students of the 1st grade were the ones who use mostly car transportation to go to school.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>N</th>
<th>No by group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>6</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>25</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>22</td>
<td>50.8%</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>6</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>25</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>22</td>
<td>49.2%</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1. Sample characterization

Variables. This is a descriptive study that aims to describe how children play daily today, as well as their dependence on mobility. For the analysis and processing of the data collected was used computerized SPSS Statistics (Statistical Package for Social Sciences) version 21 in English. The statistical treatment used was the descriptive frequency and crosstabs. We defined as dependent variables, physical activity levels, dependence of mobility and as independent variables, gender, age, school year and place of residence.

Results

Table 1. Representation values of daily activities that influence children’s mobility to physical practice

<table>
<thead>
<tr>
<th>Parents let you play outside with friends?</th>
<th>No %</th>
<th>Yes %</th>
<th>Percentages %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>23,1</td>
<td>76,9</td>
<td>Near home – 36,6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Places further – 18,8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Depends – 21,5</td>
</tr>
<tr>
<td>Is there any place in the neighborhood where you may not be with friends? Why?</td>
<td>37,1</td>
<td>62,9</td>
<td>Places with traffic – 19,4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Poorly attendance places– 3,2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Insecurity – 10,2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unknown – 16,1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Don’t know – 17,7</td>
</tr>
<tr>
<td>Do you ever visit friends? How do you go?</td>
<td>10,2</td>
<td>89,8</td>
<td>On foot – 31,2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>By car – 38,2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>By bicycle – 19,9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other – 1,6</td>
</tr>
<tr>
<td>Do you ever go walking with other children? Where?</td>
<td>43</td>
<td>57</td>
<td>Public gardens or places – 40,9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sport facilities – 12,4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Clubs – 5,9</td>
</tr>
<tr>
<td>When you go to some place, even accompanied by adults, can you cross the street alone? Which is the location where you were further away from home alone?</td>
<td></td>
<td></td>
<td>On my street – 28,5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Near my street– 31,7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other places further – 18,3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Don’t know – 14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other places far away from home – 4,8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nowhere – 2,2</td>
</tr>
<tr>
<td>Which location further away from home did you go with friends on foot?</td>
<td></td>
<td></td>
<td>On my street – 19,9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Near my street – 22,6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other places further – 17,2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Don’t know – 9,7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other places far away from home – 5,9</td>
</tr>
</tbody>
</table>
Is there some space in the location outside your neighborhood, where you usually go often? What is this space?

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.3</td>
<td>Public garden – 11.3</td>
</tr>
<tr>
<td></td>
<td>Football field – 17.7</td>
</tr>
<tr>
<td></td>
<td>kindergarten – 23.1</td>
</tr>
<tr>
<td></td>
<td>Near a coffee shop – 2.2</td>
</tr>
<tr>
<td></td>
<td>Other – 20.4</td>
</tr>
</tbody>
</table>

With whom you usually go?

<table>
<thead>
<tr>
<th>Percentage</th>
<th>With whom</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.3</td>
<td>Family – 49.5</td>
</tr>
<tr>
<td></td>
<td>Alone – 7.5</td>
</tr>
<tr>
<td></td>
<td>Friends – 17.7</td>
</tr>
</tbody>
</table>

Do you live far from the school? How do you go?

<table>
<thead>
<tr>
<th>Percentage</th>
<th>How</th>
</tr>
</thead>
<tbody>
<tr>
<td>53.8</td>
<td>On foot – 22</td>
</tr>
<tr>
<td></td>
<td>By car – 62.4</td>
</tr>
<tr>
<td></td>
<td>Public transportation – 13.4</td>
</tr>
<tr>
<td></td>
<td>Others – 1.1</td>
</tr>
</tbody>
</table>

Can you go to school with friends or alone?

<table>
<thead>
<tr>
<th>Percentage</th>
<th>With or without friends</th>
</tr>
</thead>
<tbody>
<tr>
<td>76.3</td>
<td>23.1</td>
</tr>
</tbody>
</table>

Do you practice some physical activity in a club or in other place (grade)?

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>41.9</td>
<td>1st grade</td>
</tr>
<tr>
<td>29.2</td>
<td>2nd grade</td>
</tr>
<tr>
<td>32.1</td>
<td>3rd grade</td>
</tr>
<tr>
<td>35.2</td>
<td>4th grade</td>
</tr>
</tbody>
</table>

**Discussions and conclusions**

Children who practice more physical activity are in the 2nd grade 70.8% (34), followed by the 3rd grade 67.9% (36), the 4th grade 64.8% (35) and finally the 1st grade with 58.1% (18). In general 66.1% (123) engage in physical activity and 33.9% (63) do not exercise even in a club or municipal facility.

Compared to the study of Correia (2006) 34% did practiced physical activity and 66% did not practice. Its observable changes since 2006 until the present study regarding the students who practice physical activity in a club or sports facilities.

Serrano (2003) conducted the same study and the results obtained were 24.3% practiced some sport and 75.7% did not practice any sport in sports clubs. According to the study conducted in the city of Viseu by Monteyo (2013) 14.1% of children practice physical activity 1 time per week, 42.4% practice 2 times a week, 27.3% practice 3 times a week and 16.2% perform physical activities more than 3 times per week, and in this study, results differ statistically.

According to the study of Lopes (2013) it was found that 149 (90.3%) young people have bikes, but only 65 (39.4%) are allowed to ride a bike, although children have different ages we found that the number of students who cannot ride a bike is larger (n: 72 / 43.6%), even these children were older regarding the ones in our study. In general, students ride their bikes mostly on the street 67.8% (116), then 19.03 (33) ride their bikes in the park / public garden and finally 12.9% of students ride their bikes in other places not mentioned in this questionnaire.

In another study by Correia (2006), most students 70% also rode bicycles in the street, and the same percentage 13% rode bicycles in the park / public garden and/or other places. From 2006 until now there has been an increase in students who have rode a bike in the parks / public gardens.

The mobility dependence level decrease: some data allow us to state that the autonomy in movement of children in urban areas has declined significantly in recent years (pathways, perception of physical space and action possibilities (Serrano, 2003; Mallet and Neto, 2004; O’Brien and Jones Rustin, 2000; Arez and Neto, 1999; Vercesi, 1999; Kitta, 1995; Van der Spek and Noyon, 1995; Neto and Marques, 2004).
According to Rosario et al. (2013) regarding to transport used to go to school found that 60.6% of children used the car, 21.2% walked to school, 6.1% moved on foot and by car, 12.1% by bus, although the study sample has different ages and a different city found that the studies converge with each other, yet, the most popular means of transport to travel to school is by car.

The study highlights the lack of mobility in urban areas (low density) as they move mostly by car and most students are not given autonomy to cross the road alone. We must admit an environment type “Glasshouse”, the child is familiar with the environment, but mainly through parental assistance without authorization to explore that same environment independently.

Acknowledgements
We would like to say thanks to all children who participated in this study.

References


IDENTIFYING THE INTRAPERSONAL COMMUNICATION BARRIERS IN THE ALPINE SKI AND ELIMINATING THEM THROUGH SPECIFIC METHODS AND RESOURCES

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* Corresponding author: vali.caracas@yahoo.com

Abstract. The study titled "Identifying the intrapersonal communication barriers in the alpine ski and eliminating them through specific methods and resources" has the purpose of identifying the intrapersonal communication barriers that might appear in alpine ski, barriers installed many times to beginner students when practicing this sport. The reason why we approached this topic was to increase the efficiency in the school process by identifying and eliminating the causes of these installed barriers. The main assumption was that the intrapersonal communication barriers can be identified and removing them might be done by eliminating the causes that led to their installation. The study was based on an observant ameliorative pedagogical experiment, which was done during 14 lessons, on a sample of 67 participants aged 19-20 years old, at the educational base V Teodorescu from Parâng, between 21st February and 5th March 2016. The program to eliminate the causes that determined the installation of the intrapersonal communication barriers has specific methods and resources which were used individualized according to each participant particularities. The results of this research, which are in the content of this study, have been processed statistically and mathematically, analyzed and interpreted. In the end the conclusions of the experiment have confirmed the research assumptions, meaning that intrapersonal communication barriers have been eliminated.

Keywords: Communication, alpine ski

Introduction

The accumulated experience during the instruction activity of the NUPES students, beginners in the alpine ski, has revealed that each year some students have difficulties in the learning process in the basic techniques of this sport. This aspect is manifested at the end of the course by low grades or even graduation difficulties at the practical exam. This reason determined us to approach this topic.

The purpose of the study was to identify and remove the causes that determine the occurrence of these communication barriers. During practical training of students in alpine skiing (which is performed in a centralized training course at the educational base V Teodorescu NUPES from Parâng) all students receive the same training conditions and go through the same work program. To identify issues that cause these differences, we analyzed each case, the intermediate assessments and found that the reasons are varied (Cârstocea et al., 2001).

We believe that these issues found in students with such problems are reflected in the emergence of intrapersonal communication barriers. As such in specialty literature, most authors agree that communication barriers are elements that occur in the communication process and can exert negative influences on the performance of the training process.

Noting that the reasons why some students come across difficulties in the training process are particular, by identifying the causes that determined them and consulting the specialty literature, we established that these barriers are intrapersonal (Pease & Pease, 2013).

As is known, biologists think that the motor and technical manifestation of athletes, and intrapersonal communication are essential and are based mainly on the proper functioning of the proprioceptive sense. In turn the proper functioning of the proprioceptive sense is based on morphological and functional integrity of the neuromotor plaque, namely the articular musculoskeletal proprioceptors, the afferent sensorial pathways, the motor area of the frontal lobe and the efferent motor pathways. The proprioceptors realize the permanent and adequate modulation of the contraction of the various muscle groups and implicitly the segmental coordination of the athletes in every motor actions undertaken.

We mention here that skiing equipment, (boots and skis), is tightly connected to the inferior limbs and forms a whole with the athlete’s body and every issued specific movement is transmitted to the skis (Pelin, Stroe & Runcan, 2001).

In the training process practice in alpine ski, the intrapersonal communication barriers can manifest as follows (Dina, 2014):

- The intrapersonal communicational blockage
- The intrapersonal communicational jam
- The intrapersonal distortion of information
The intrapersonal filtering of information

The intrapersonal communication barriers in alpine ski and the causes that lead to their occurrence, that we identified with the NUPES basic training were:

The intrapersonal communicational blockage represents the total of the work ability.

The causes can be:

- Of physical nature – serious injury during the lesson;
- Of material nature – braking the ski equipment and impossibility of continuing the lesson;
- Of mental nature – fear of injury, set through repeated falls;

The intrapersonal communicational jam implies the perturbation of the coordination of the specific movements, of executions.

The causes can be:

- Of physical nature – muscular or joint pains resulting from older injuries;
- Of material nature – inadequate equipment (skis, boots);
- Of environment – ice on the slope, snow that sticks to the sole of the skis, factors that affect the right driving of the skis;
- Of psychomotor nature – weak segmental coordination, insufficiently developed dynamical balance.

The intrapersonal communicational distortion – represents the occurrence of some elements that affect the ability of correct execution;

Causes:

- Of physical nature – the incorrect forming of the execution representation.

The intrapersonal communicational filtering, represents the existence of some difficulties in processing information, in taking decision, in transmitting execution commands, in adapting to the environment conditions.

Causes:

- Of mental nature – lack of trust in oneself, hesitation in taking quick decisions, fear of acting emphatically, passive participation in training;
- Of motor nature – insufficient developed motor skills for the correct execution of the specific movements.

Materials and methods

The research objectives were:

General objectives:

- Identifying students that after the intermediate appreciation, after the 7th practical lesson took place, were in the situation of not having promotion perspectives of the practical exam in alpine ski;
- Identifying the intrapersonal communication barriers, set during the practical training process;
- Establishing of methods and means of removing the causes that determined setting of intrapersonal communicational barriers:
  - The individual and individualized training method
  - Repetition method

Training objectives:

- Correcting the basic position in maintaining dynamic balance;
- Ascertaining the correct basic position for direct descent;
- Ascertaining the correct basic position for diagonal descent;
- Learning the basic rotation;
- Learning the basic swing rotation;
- Learning and consolidating of the swings through rotation downhill.

The means established for achieving the training objectives were specific means, individualized based on the particularities of each participants. The training was individual outside of the frontal training schedule with the other students.

Hypothesis

Some elements of material, physical, motor or environmental nature, can determine the occurrence of intrapersonal communicational barriers in alpine ski.
Identification of the causes that led to setting these intrapersonal communication barriers and their removal, through specific methods and means will determine the growth in performance in the training process of the students of the alpine ski course.

**Methods of research**

The methods used in research were:

Study of the literary field material, pedagogical observation, the test, the pedagogical experiment, the statistical mathematical processing. The research done was of the observing ameliorative experiment type, it took place between the 22nd of February and 5th of March, at the didactical camp V. Teodorescu of NUPES in Parâng. There were 67 participants in the study, with ages between 19-20 years old, all of them being considered beginners in practicing alpine skiing.

**Results**

As a result of the intermediary appreciation using anamnesis and pedagogical observation, after a number of 7 lessons, it was found that 12 participants had no perspectives of promoting the practical exam, due to the negative influences of the intrapersonal communication barriers.

Definitively, it was found that they needed additional training in comparison to the other participants. These additional training lessons, in number of 5, done outside of the schedule of the other students, were done to lead to the removal of the causes that determined the setting of intrapersonal communicational barriers.

In table 1 are represented the participants with intrapersonal communicational barriers, the nature of the barriers, the causes that determined setting these, the effect of the cause and the methods and means of eliminating the causes.

<table>
<thead>
<tr>
<th>No.</th>
<th>Set barrier</th>
<th>Nature of the communicational barrier</th>
<th>Causes of the barrier setting</th>
<th>The effect of the cause</th>
<th>Methods and means of eliminating the cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blockage</td>
<td>Physical</td>
<td>Injury during the lesson</td>
<td>Total interruption</td>
<td>Recovery through individualized training</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 lessons</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Blockage</td>
<td>Physiological</td>
<td>Cold</td>
<td>Total interruption</td>
<td>Recovery through individualized training</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 lesson</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Blockage</td>
<td>Mental</td>
<td>Fear set through repeated falls</td>
<td>Refusal of working for 2 days</td>
<td>Recovery through individualized training on a range with smaller inclination</td>
</tr>
<tr>
<td>4</td>
<td>Blockage</td>
<td>Material</td>
<td>Breaking the ski binding</td>
<td>Inability to continue</td>
<td>Recovery through individualized training</td>
</tr>
<tr>
<td>5</td>
<td>Jam</td>
<td>Physical</td>
<td>Incomplete recovery after an older injury</td>
<td>Knee pains, fewer repetitions</td>
<td>Recovery through individualized training</td>
</tr>
<tr>
<td>6</td>
<td>Jam</td>
<td>Material and environment</td>
<td>Used up ski edges. Frozen snow</td>
<td>Losing control of the skis</td>
<td>Switching the skis and recovery through individualized training</td>
</tr>
<tr>
<td>7</td>
<td>Distorsion</td>
<td>Psychomotor</td>
<td>Reduced segmental coordination</td>
<td>Incorrect weight</td>
<td>Recovery through individualized training</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>distribution on skis</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Distorsion</td>
<td>Mental</td>
<td>Misunderstanding of the technical execution</td>
<td>Incorrect execution</td>
<td>Recovery through individualized training</td>
</tr>
</tbody>
</table>
After the intermediary analysis of the level of training of the 67 students, done after the first 7 lessons, we concluded that a number of 12 students were poorly trained and did not have perspectives of accomplishing the training objectives and promoting the practical exam. From a statistical point of view, they represented a pretty high percentage, 17.8% respectively, if we take into account the fact that this practical course is taking place under the conditions of a centralized camp.

We mention that the other 55 participants, were subjected to the negative influence of some elements, especially environments conditions, frozen snow, frost, tiredness, repeated falls on the slope. But the influence of these factors wasn’t so powerful as to determine the setting of intrapersonal communicational barriers.

To eliminate these barriers, identification of the causes that produced them was necessary, and then establishing some means of removing these causes. The elimination of the causes could not be made completely with every barrier. The difference between the results of trying to eliminate the barriers, was given by the nature of the causes that led to their setting.

As such, as you can see in Fig. 2, the best results were obtained with the objective causes of mental and material nature.

The weakest results have been recorded with the elimination of the subjective causes of physical nature, psychomotor and physiological.

From the analysis of the causes that led to setting the intrapersonal communicational barriers, we concluded that with all subjects the consequence was the same: insufficient repetitions, incorrect executions and few technical accumulations.

As following to this conclusion, we concluded that these 12 subjects need additional training. So we have set a schedule of 5 additional lessons, afternoon between 15:00-17:00, outside of the morning schedule of frontal training. So in total these students undertook a course of 19 lessons, in comparison to the 14 lessons that were taken by the other students, unaffected by communication barriers.

As methods of training we used the method of repetition and the method of individual training. The established means were those specific and individualized to each participant.

The results of the elimination of the intrapersonal communication barriers program, were positive and took form in the grades that the students obtained during the practical exam of the ski course. The results obtained by the 12 students are presented in table 2.

Table 2. Results obtained during the 19 practical lesson

<table>
<thead>
<tr>
<th>No.</th>
<th>Intrapersonal communication barrier</th>
<th>Cause of setting the barrier</th>
<th>Control exam and grade</th>
<th>Difference between lesson 7-19</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Simple pivoting Lesson 4</td>
<td>Swing pivoting Lesson 7</td>
</tr>
<tr>
<td>1</td>
<td>Blockage</td>
<td>Injury</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Blockage</td>
<td>Sickness</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>
The algorithm after we have oriented ourselves in identifying the intrapersonal communication barriers and removing them contained 6 stages as follows: effect 1, (consequence). Intermediary evaluation of the training level; identification of the interpersonal communication barrier; determination of the cause of occurrence of the barrier; acting to remove the cause; removing completely or partially the intrapersonal communication barrier; effect 2. Modifying the effect in the desired direction. Final evaluation.

To this purpose we propose the following schematic followed by the action of removing the barriers of intrapersonal communication, fig. 1.

**Discussion and Conclusions**

From table no. 2 containing the results obtained at the practical exam, we can observe that all participants obtained grades over 5, so grades of exam promotion.

To the causes of material nature we acted by replacing the damaged skis, and to those of mental nature, where the causes were fear and forming of incorrect representation we acted by individualized training on a slope with a lower degree of inclination, respectively 11% compared to 18% where sliding speed was higher. The grades obtained at practical exam were 8, respectively 7.

To the causes of psychomotor nature, respectively poor spatial orientation and poor segmentary coordination, it was acted accordingly individualized, by analytical methods, intensifying the phases of evasion triggering and that of the moment of distribution of the weight on the ski on exterior of the evasion. The grades obtained were the lowest, respectively 5.

---

### Table 1: Intrapersonal Communication Barriers

<table>
<thead>
<tr>
<th>No</th>
<th>Blockage</th>
<th>Fear</th>
<th>1</th>
<th>4</th>
<th>7</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Blockage</td>
<td>Broken skis</td>
<td>1</td>
<td>4</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Jam</td>
<td>Joint pain</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Jam</td>
<td>Used up skis</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Distorsion</td>
<td>Lack of segmentary coordination</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Distorsion</td>
<td>Incorrect processing of information</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Distorsion</td>
<td>Poor spatial orientation</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Filtering</td>
<td>Passive participation</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Filtering</td>
<td>Rapid tiredness</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>Distorsion</td>
<td>Incorrect representation</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

---

**Fig. 1.** The schematic of removing the intrapersonal communication barriers
The causes of physical nature, injuries, could not be removed, but pains were avoided, by diminishing strain, in the individualized training also on a slope with a reduced inclination of 11%. The grade obtained by the two students was very low, of 5.

Other two students obtained grades of 5 and 6. The causes of setting the communication barriers were of a physiological nature, rapid installment of tiredness, respectively insufficient strength in the inferior limbs. To remove the causes of setting the communication barriers of these two students, individualized programs were established, and the training slope was also that of 11% inclination. Other two students had barriers in intrapersonal communication, due to their health state (cold) and to misunderstanding the technical mechanism of the rotation process. The grades obtained by them at the practical exam were 6 and 5.

Two participants that were under the influence of certain causes of mental nature, respectively fear and incorrect forming of the representation, had the most significant growth in training, obtaining the grade 8 at the practical exam. On the second position of progress there were two participants, that had as a cause of setting barriers of intrapersonal communication, of material nature, respectively damaged skis. After changing the skis, they progressed obtaining the grade 7 at the practical exam.

The weakest results were obtained by 6 students, obtaining the grade 5, the minimal promotion grade. Which underlines the causes that determined the occurrence of communication barriers, is the fact that for the students with the lowest grades the causes were exclusively of an subjective nature. As such, 2 students were injured, 2 students had a low psychomotor level, and the other 2 did not have the motor skills sufficiently developed for practicing alpine ski.

Following the analysis and the interpretation of our obtained results we come to the following conclusions:

In alpine ski the factors that can determine setting the barriers of intrapersonal communication, can be of the nature: physical, psychomotor, motor, physiological, environmental.

Identifying the causes that lead to the setting of intrapersonal communication barriers and the nature of these, represent the basic stage in the development of the program of removing the communication barriers.

The intrapersonal communication barriers once set, the afflicted record a decrease of the training ability, due to the lower number of repetitions and incorrect executions.

The causes that lead to the setting of intrapersonal communication barriers, can be removed with the help of certain specific means and methods, applied on the basis of an individual and individualized program, specifically to each case, according to the nature of the barrier.

The communication barriers of material nature, in the case of this research the damaged ski equipment, can be eliminated faster, than in the case of those of physical nature like injuries.

References
FACTORS THAT INFLUENCE THE FUNCTIONAL RECOVERY OF THE KNEE AND RETURN TO SPORT AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION TO PERFORMANCE SPORTSMEN

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Abstract. Anterior cruciate ligament (ACL) is the most commonly injured anatomical structure of sportsmen who practice contact sports (football, basketball, handball, etc.) and noncontact sports (skiing, skating, etc.). How ACL does not heal in a manner to restore biomechanical knee reconstruction, surgery has become the standard arthroscopic technique in restoring stability of the injured knee joint. Allowing a patient to return to unrestricted sports activity and physical activity after ACL tear and arthroscopic reconstruction is one of the most difficult decisions for the orthopedic surgeon, who must consider a variety of factors. The purpose of this article is to present the main intrinsic and extrinsic factors that influence return to sports activities of a group of 37 football players, who conducted intensive functional rehabilitation program after knee arthroscopic reconstruction of ACL. We will also present the criteria used to return to the sport, according current trends in literature.

Keywords: recovery, knee, anterior cruciate ligament reconstruction

Introduction

Successful return to sport is multifactorial and influenced by many different factors (Kyritsisat et al., 2014). The current literature contains plenty of studies aimed at evaluating return to sport, and the factors that may affect or predict this outcome (Arden, 2011; Zaffagnini, 2015). The most common factors are “intrinsic” (related to the individual) and “extrinsic” (related to the environment). In this review, we will focus on intrinsic factors, which are often divided into genetics/biological response, anatomical, neuromuscular and familial (Ayala et al., 2012). The “extrinsic” factors are the preinjury status of the athlete, associated knee injuries, time to surgery, surgical technique, knee kinematics after injury/surgery, rehabilitation protocol, compliance, functional knee stability, knee symptomatology and the level/intensity of the sport (Arden et al., 2011). The achieved level of muscle function, psychological factors, such as fear of re-injury and lowself-efficacy beliefs, the patients “desired” physical activity level and social factors, such as family or work career, are also frequently discussed (Mayer et al., 2011; Arden et al., 2011). Furthermore, it has been noted that patients’ compliance decreases over time during the rehabilitation process (Arden et al., 2012). ACL-reconstructed athletes express frustration on that the progress during rehabilitation is much slower than they had expected. As a result, the compliance of some patients decreases, some will even give up, while others increase their efforts and continue with their rehabilitation (Paterno et al., 2010).

Intrinsic factors

The decision to allow an athlete to return to sport should be based first of all on a series of intrinsic factors, that depend exclusively on the patient himself. Each patient is unique and therefore generalisation of rehabilitation protocols could lead to unsatisfactory outcomes. Awareness of the following aspects could help clinicians to optimise outcomes and possibly avoid failures as well. Genetics/biological response. Every patient has his own specific genetic makeup and biology. This should not be neglected, as lack of incorporation of the graft and biological failure are well-recognised causes of poor outcomes after ACL reconstruction (Menetry et al, 2008). Moreover, graft healing, measured by graft signal intensity on magnetic resonance imaging (MRI), has been shown to affect anteroposterior (AP) laxity and clinical or functional outcomes (Bierecevicz et al., 2015). Therefore, the clinician should be aware that graft maturation is a slow process that can even take longer than two years (Zaffagnini et al., 2010), and must be sure that it is complete before allowing activities that could stress an incompletely remodelled graft.

Anatomical features. Anatomical features, can potentially affect outcomes. Morphological knee parameters such as tibial slope, notch width, and femoral condyle shape have been correlated with increased risk of ACL injury, ACL reconstruction failure or post-operative laxity (Sturnik et al., 2015). Furthermore, with regard to knee alignment, varus deformity has been postulated to increase tension on the ACL (van de Pol et al., 2009). Type of lesion. The lesion pattern and concomitant injuries can also influence return to sport and other outcomes. First of all, the menisc has been demonstrated to interact closely with the ACL contributing to increased stability in vitro. Medial meniscal deficiency is responsible for increased stress on the ACL during AP tibial translation (Spang et al., 2010), while lateral meniscal deficiency is responsible for increased rotational laxity during the pivot-shift
manoeuvre (Musahl et al., 2010). Therefore, meniscal deficiencies should be considered, in order to identify patients with higher laxity and a potential risk of failure. Concomitant lesions such as cartilage injuries, are, a fundamental variable in the final return to sport decision, as even isolated cartilage, or microfractures usually need a longer recovery time compared with ACL reconstruction, i.e. about 8–12 months even in competitive athletes submitted to aggressive rehabilitation (Kone et al., 2011). Motivation. This is another crucial factor that could jeopardise a successful reconstruction and rehabilitation outcome. In fact, patients’ motives for sports participation and motivational orientation have been found to correlate with post-operative pain, symptoms, type of sports activity and participation in low or high risk sports (Roessler et al., 2014). Psychological attitude. Apart from motivation, the patient’s character and psychological attitude could also affect ACL reconstruction outcomes. Several psychological scales have been reported to predict the ability to return to sport; this is confirmed by evidence that the reason for abandoning sport may not be related to objective knee problems but rather to psychological issues such as fear of reinjury, family or personal problems, or other factors (Arden et al., 2013; Arden et al., 2014). In this regard, a psychological intervention was recently demonstrated to improve clinical outcomes after ACL reconstruction, highlighting the importance of the patient’s psychological state (Zaffagnini et al., 2013).

Extrinsic factors

There are other several important factors related mainly to technical issues and the choice of graft that may affect the final outcome and should therefore be taken into consideration, helping to guide the clinician through the return-to-sport decision process (Zaffagnini et al., 2015; Thomeé et al., 2011). Type of graft. This is undoubtedly one of the most debated and controversial issues of the whole ACL reconstruction field. It is well known that there is no such thing as the ideal graft, as each graft has advantages and disadvantages. One of the crucial aspects to consider in relation to the graft is its maturation. It is in fact well known from histological studies that autografts like bone-patellar tendon-bone (BPTB) grafts and hamstring grafts show quite rapid healing compared with allografts (Zaffagnini et al., 2010). During the graft healing and maturation process the graft undergoes an initial phase of necrosis, followed by fibroblast proliferation and reorganisation. These initial phases could constitute a particularly delicate moment in the rehabilitation protocol, as the graft may be not ready to withstand the stress of certain athletic actions and movements. Also the integration between bone and bone (in the case of a BPTB graft) or bone and ligament (in case of a hamstring graft) can affect the initial stability of the reconstruction and therefore make it unsafe to perform aggressive physical exercises. Surgical technique. This is another much debated variable that could influence the success of an ACL reconstruction. Single- or double-bundle techniques, or the use of additional lateral plasty, have been often compared in order to identify the technique showing the best performance; however, when sports activity is considered, the results are still controversial. Zaffagnini et al. (2008) reported a higher rate of return to sport and faster recovery in patients treated with double-bundle compared to single-bundle reconstruction. Dejour et al. (2013) showed that lateral plasty had no effect on the return to sport rate, while Zaffagnini et al. (2006) reported better results for lateral plasty compared with isolated single-bundle reconstruction.

Rehabilitation phases. Since the introduction of the “accelerated rehabilitation” concept by Shelbourne and Gray (Shelbourne et al., 2007), being able to return to sports activity as fast as possible has become a vital goal, especially for high-level athletes. Therefore patient-tailored rehabilitation protocols have been developed, structured in progressive phases – specific goals rather than temporal criteria must be met in order to progress from one phase to the next – and involving on-field rehabilitation with sport-specific movements and actions (Della Villa et al., 2012). Application of these principles allowed professional athletes to return to sport as soon as three months after ACL reconstruction. However, caution should be used, as early return to sport has been demonstrated to be related to ACL failure, in cases of primary reconstruction with allograft tissue. Biological support. Since maturation of the graft is a crucial process during the recovery after ACL reconstruction, several studies have examined the issue of how to improve graft healing. Radice et al. (Radice et al., 2010; Codorean, 2014) reported that application of a platelet-rich plasma gel to the ACL graft significantly reduced the graft maturation time measured on the basis of MRI.
Return to sport

In one of our studies, for a period of 6 years, interval according March 2009 - May 2015 was a group comprised 57 patients athletes from different sports branches which have received treatment by the recovering knee reconstruction, consecutive arthroscopic anterior cruciate ligament. We selected a total of 37 athletes, football players from Romanian first league (12), second league II (14) and third league (11) who suffered acute trauma of the knee lead to complete rupture anterior cruciate ligament (Table 1). Patient age limits were in the range of 18-35 years old, mean age 25.5 years old. Right knee was affected in 23(62%) patients and left knee in 14(38%) patients. Neoligament reconstruction was made to all athletes by autologous grafts of muscle tendons gracilis and semitendinosus using a graft mono fascicular "single bundle" for 12 patients (32%) and graft bifascicular "double-bundle" at 25 (68%) patients. Preoperative rehabilitation began immediately after the knee ACL rupture for a number of 11 (28%) patients. Table 1 presents patients who underwent preoperative recovering, age, type of lesions, associated with isolated ACL, tear meniscus and / or cartilage, and duration of rehabilitation.

Table 1. Patients who underwent preoperative recovery

<table>
<thead>
<tr>
<th>Patients</th>
<th>Age</th>
<th>ACL isolated rupture</th>
<th>Associated injuries</th>
<th>Time of recovery/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>O.C.</td>
<td>18</td>
<td>X</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>M.C.</td>
<td>26</td>
<td>X</td>
<td>26</td>
</tr>
<tr>
<td>3</td>
<td>G.A.</td>
<td>25</td>
<td>X</td>
<td>19</td>
</tr>
<tr>
<td>4</td>
<td>M.V.</td>
<td>28</td>
<td>X</td>
<td>27</td>
</tr>
<tr>
<td>5</td>
<td>A.N.</td>
<td>28</td>
<td>X</td>
<td>24</td>
</tr>
<tr>
<td>6</td>
<td>G.S.</td>
<td>24</td>
<td>X</td>
<td>22</td>
</tr>
<tr>
<td>7</td>
<td>M.R.</td>
<td>34</td>
<td>X</td>
<td>23</td>
</tr>
<tr>
<td>8</td>
<td>G.B.</td>
<td>35</td>
<td>X</td>
<td>27</td>
</tr>
<tr>
<td>9</td>
<td>A.P.</td>
<td>33</td>
<td>X</td>
<td>26</td>
</tr>
<tr>
<td>10</td>
<td>L.D.</td>
<td>18</td>
<td>X</td>
<td>16</td>
</tr>
<tr>
<td>11</td>
<td>M.G.</td>
<td>22</td>
<td>X</td>
<td>20</td>
</tr>
</tbody>
</table>

Functionally, these athletes had affected knee joint instability manifested by episodes of "giving way", weaknesses in muscle strength, proprioception, muscle-synchronization and change of walking. Preoperative phase took place gradually over a period of time between 14 and 27 days.

Postoperative recovery program for the entire group of patients was conducted over a period of time between 6 and 9 months and comprised two phases.

The first phase took place in the hall of kinesiology and comprised three phases, the first postoperative day until 12-14 weeks, and had as main objective the reduction of joint pain and swelling, restoring full passive extension of the knee joint, restoring patellar mobility of the knee, progressive flexion improvement, restoring control quadriceps, and restore independent ambulation.

The second stage took place on the sports field under the supervision of physiotherapist and covered the range from 12 to 14 weeks, to resume sports activities cca.20-26 weeks. The objective of this stage, named "athletic enhancement" has been conducting training in specific football game. Table 2 shows the entire group of patients, the type of rupture of the ACL, isolated or associated with meniscal and chondral injuries, preoperative recovery and intervals of surgical neoligament reconstruction.
Table 2. The type of rupture of the ACL

<table>
<thead>
<tr>
<th>NO</th>
<th>PATIENT</th>
<th>PREOPERATIVE REHABILITATION</th>
<th>NO PREOPERATIVE REHABILITATION</th>
<th>SURGICAL INTERVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ACL RUPTURE WITH ASSOCIATED INJURIES</td>
<td>ACL RUPTURE WITH ASSOCIATED INJURIES</td>
<td>WEEK 1</td>
</tr>
<tr>
<td>----</td>
<td>---------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ACURtery</td>
<td>MENDICUS INJURIES</td>
<td>CARTILAGE INJURIES</td>
</tr>
<tr>
<td>1</td>
<td>C.G.</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2</td>
<td>P.C.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>3</td>
<td>B.C.</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>4</td>
<td>O.C.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>5</td>
<td>A.Z.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>6</td>
<td>M.C.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>7</td>
<td>A.M.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>8</td>
<td>A.V.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>9</td>
<td>S.P.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>10</td>
<td>G.A.</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>11</td>
<td>M.V.</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>12</td>
<td>V.A.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>13</td>
<td>A.N.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>14</td>
<td>L.A.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>15</td>
<td>G.S.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
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<td>A.D.</td>
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<td>x</td>
<td>x</td>
</tr>
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<td>17</td>
<td>S.B.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>18</td>
<td>N.D.</td>
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<td>x</td>
<td>x</td>
</tr>
<tr>
<td>19</td>
<td>M.R.</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>20</td>
<td>C.M.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>21</td>
<td>G.B.</td>
<td></td>
<td>x</td>
<td>x</td>
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<td>B.V.</td>
<td></td>
<td>x</td>
<td>x</td>
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<td>23</td>
<td>A.P.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>24</td>
<td>A.C.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>25</td>
<td>L.D.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>26</td>
<td>A.A.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>27</td>
<td>M.G.</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>28</td>
<td>I.C.</td>
<td></td>
<td>x</td>
<td>x</td>
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<td>29</td>
<td>G.C.</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
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<td>M.R.</td>
<td></td>
<td>x</td>
<td>x</td>
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<tr>
<td>32</td>
<td>M.C.</td>
<td></td>
<td>x</td>
<td>x</td>
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<td>L.D.</td>
<td></td>
<td>x</td>
<td>x</td>
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<td>M.C.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>35</td>
<td>R.D.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>36</td>
<td>F.M.</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>37</td>
<td>C.C.</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Returning to the same level of sporting activity was different, and comprised mainly intinsec factors including the type of lesion of the ACL, isolated and associated with meniscus and cartilage damage, fear and motivation of re-injury athlete. Extrinsic factors identified relate to the recovery phase of the second stage on the play ground during the time 4-6 months after surgery. Table 3 shows the intervals are returning on the field at competition level at 6 months postoperatively. Of the total number of 37 athletes 34 (92%) have been fully implicated in sessions of recovery program, 3 (8%) athletes require the extension between 7 and 9 months. On the final follow-up, 26 (70%) of the 37 patients were able to return to their pre-injury sport at the same level; 8 (22%) shifted to a lower activity level while the remaining 3 (8%) were unable to return to previous level of their sports activities. Among the three patients which were unable to return to sports, one feared re-injury to their reconstructed knee, another one had pain related to chondropathy, and one had deficit extension.
Table 3. Outcomes following ACL reconstruction

<table>
<thead>
<tr>
<th>Football league</th>
<th>Type of ACL rupture</th>
<th>Pre injury level outcome</th>
<th>Under pre injury level outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Isolated</td>
<td>+ Meniscus</td>
<td>Cartilage</td>
</tr>
<tr>
<td>First</td>
<td>12</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>Second</td>
<td>5</td>
<td>4</td>
<td>10 3</td>
</tr>
<tr>
<td>Third</td>
<td>7</td>
<td>4</td>
<td>3 5</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>7</td>
<td>26 (70%) 8 (22%) 3 (8%)</td>
</tr>
</tbody>
</table>

First league football players have performed a greater total number of sessions and with greater frequency, therefore the recovery was faster. However, the rehabilitation protocol was based on functional recovery rather than the temporal criteria. Patients have progressed along the stages of recovery depending on the individual response, which has led to fulfilling the ultimate goal at different times and with different number of sessions.

Given the numerous variables that can interact and play a minor or major role in the decision to allow a patient to return to sport, it appears quite obvious that the rehabilitation and eventual return to sport should be a progressive and patient-tailored process. In an interesting systematic review, Barber-Westin & Noyes (2011) found that, in most of the 264 studies included, the sport resumption decision was based on subjective non-specific criteria such as “regained full functional stability”, “normal knee function on clinical examination”, “good/normal/satisfactory stability” or “close to full ROM and muscle strength”. When objective criteria were considered, time since surgery, muscle strength, ROM and effusion were the ones most frequently used. As regards the first of these criteria, the vast majority considered 6 months as a cut-off value for allowing sport resumption, without major differences emerging between grafts. This trend was confirmed by a survey of 211 expert surgeons, members of the German Arthroscopic Association (AGA), most of whom allowed sport-specific rehabilitation after 4 months, return to training between 4 and 6 months, and return to competitive sports after 6–8 months (Del Torto et al., 2014). As regards muscle strength, the cut-off value of >90% isokinetic strength compared to the contralateral side was the criterion most used, followed by lower values of the same parameter (>85%, >80%) or different parameters, such as a quadriceps index >90% and weighted leg extension >90% (Malinin et al., 2002). The same AGA survey confirmed the trend reported by Barber-Westin and Noyes, identifying ROM, the Lachman test and the pivot shift test as the most widely used objective criteria, and finding a surprisingly limited use of validated clinical scales (Petersen et al., 2014). The rationale for the use of such scales is summarised by the study of Jang et al. (2014), who noted significantly worse muscle strength and rotational stability in athletes who were not able to return to sports activity.

The trends and evidence here reported certainly highlight the need for precise objective measurement criteria, and future efforts should therefore be focused on the improvement or development of tools designed to measure and quantify patient performance. Recently there has been considerable interest in quantification of the pivot shift test, with the development of methods using, for example, accelerometers, image-based software, tablets and an iPad application to measure acceleration or tibial translation during the pivot shift manoeuvre (Zaffagnini et al., 2014). Future studies will be focused on motion analysis of specific athletic movements and actions.

The last important variable, often neglected in clinical studies, is the type of sport practised by patients. In fact an analysis from the recent literature highlights a quite surprising lack of sport-specific outcomes of ACL reconstruction. Warner et al. (2011), in their systematic review, cited only eight studies reporting the outcomes of ACL reconstruction in patient cohorts involved in a single, specific sport. The results revealed, albeit with a limited level of evidence, different rates and timing of return to sport for different types of sport (higher in activities like cycling and jogging compared with cutting and jumping activities). It is clear, therefore, that there is plenty of room for improvement in this field: evidence-based sport-specific rehabilitation protocols need to be developed and evaluated in order to achieve the best outcomes for each athletic population (Arundale et al., 2015). In this regard, Zaffagnini et al. (2014), using a sport-specific programme, showed promising results in the treatment and rehabilitation of professional soccer players, with return to training at 6 months in almost 80% of
patients, compared to 40% and 37% in other similar cohorts (Waldén et al., 2011), and return to official matches at a mean of 186 days after surgery.

Conclusions

The decision to allow a patient to return to sport is still a challenge for the clinician. The available evidence is inconsistent and the variables involved are multiple. Therefore, no standardised criteria should be applied to each patient indiscriminately. Instead, it would be preferable to apply patient-tailored rehabilitation protocols and return-to-sport criteria, based on individual characteristics. In our study, 26(70%) patients returned to pre injury level at 6 months, 8 (22%), returned under pre injury level and 3(8%) at 9 months after surgical intervention. Future efforts should be directed at improving the objective evaluation of patient performance, in order to measure the variables most likely to affect the patient’s ability to perform unrestricted physical activity.

References


BIOMECHANICAL ASPECTS ON UPPERCUT PUNCH

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Abstract. On the basis of the methodology presented in previous works, but adapted as necessary, in this article we present some biomechanical aspects of uppercut punch. The uppercut punch is used in some combat sports (boxing, kick-boxing, Thai-boxing) with an upward trajectory, targeting the opponent’s chin or solar plexus. Alongside the hook and swing, uppercut is one of the power punches (according to statistics). This is an observational study. The participant in the research is the World Champion in full-contact kick-boxing this year on the 63 kg weight division. The data acquisition was performed using the MOVEN equipment in the Sports Club Ciprian Sora’s dojo. The athlete executed ten full-contact upper-cut strikes in a 40 kg suspended boxing bag. The obtained data using the MOVEN equipment are processed in Excel. After calculating the spatial position and interest’s segments velocity, the wrist’s acceleration and intersegmental angles, we established the time limits of composing sequences of the movement and we calculated the average velocity of the fist intersegmental angles, maximum velocity of the fist and the minimum acceleration of the fist. We watched intersegmental angles evolution in these movement sequences and we focused on the kinetic coupling of the lower body with the upper body reflected by the correlation of the hips and shoulders line (concepts presented in earlier works). We also tried to define the impact through the cinematic parameters looking at the fist’s trajectory projection in the horizontal plane, keeping the trace of the fist at every frame and correlating the changes of the trajectory with the acceleration.

Keywords: uppercut; biomechanical analysis; MOVEN.

Introduction

This work is part of a series meant to study the punch strikes. After analysing thoroughly the direct punch strikes, both jab and cross equally applied in full-contact, semi contact or non-contact (Băițel & Deliu, 2013), we presented the work entitled Comparative Study of Kinematic Parameters of Circular Punch Applied in Semi-contact and Full-contact System. The aim of this paper is to study and analyze the uppercut hit.

Uppercut is a technique used in the close fight, although kick boxers usually prefer distance fight. In the ring, fighters more often use cross or swing hits, because the speed of the punch is much higher (Expert boxing, 2016). The use of uppercut can be, in a way, risky, because of the moment in which the guard is neglected. In spite of all that, a well-placed uppercut is a short strike that comes from such an angle and with such a force that it can make the opponent KO, having in mind that this strike targets vulnerable points such as the chin, the liver, the spleen or the solar plexus.

The pushing in the leg on the same side as the fist that strikes is of extraordinary importance. The power comes from the ground’s reaction when the leg pushes it, as the pushing in the knee adds force to the strike, but the rotation of the hips amplifies the power of the uppercut. The hips amplify the power through rotation and through a lift on the side of the attack (in the case of an ascendant strike). The launch of the punch is perfectly synchronized with the body’s rotation. The impact is produced whilst the hips are rotating. What happens if the body first gets down and then rises together with the strike? The weight center will rise and it will be easier for the opponent to unbalance the executants of the hit. Another disadvantage is that the uppercut will have less power because of the fact that the body’s rotation is at semi-height instead of doing it with grounded power. Another reason to rotate the body is that after the hit, the body is armed and ready for another hit when it rotates back. The result of the body’s rotation is that the torso and shoulder’s musculature is forced to stretch before the contraction, generating elastic energy which will empower the contraction. What is more, during the acceleration phase, the torso does not rotate only around the longitudinal axis, but also around the antero-posterior and medial-lateral ones, creating a combination between lateral extension and flexion on the side of the strike. It is possible that this movement will force the torso’s musculature to stretch more, in this way increasing its contribution to the force and speed of the hit (Cabral et al., 2010).

Materials and methods

The present research has found, by achieving the data acquisitions with the MOVEN equipment for a full-contact kick boxing performer (vice champion of the world in 2014 and world champion in 2015), processing and interpretation of this data based on the methodology presented in the works quoted before, but which has been adapted to emphasize the essential aspects of the striking technique uppercut. The data acquisition was done.
at Ciprian Sora Sport Club in August 2014 on a participant (63 kg, 1.63 m) found in the pre-competitive period. The MOVEN equipment (Xsens, 2014) has been mounted on the subject using the bands variant, then the subject applied 11 full contact uppercut strikes, with the back hand, in a suspended, 40 kg boxing bag.

The data acquisition has been exported into .mvxn format and then processed in Excel 2013. Starting from the segment’s position in each plan we calculated the positions in space, the fist’s speed, its acceleration, the elbow’s flexion angle, and the arm’s angle with the vertical. Also, we calculated the hip’s and shoulder’s line, the right fist’s and hips’ height and we followed their variation in time on the duration of the executions. We also delimited the succession of the sequences that compose the execution of the technique.

The way in which the right hip works during the uppercut executed with the right back hand was highlighted through the representation of its variation in time, being correlated with the representation of the fist’s variation in time, so that we can analyze the height of the hip in the moment of impact (as it was argued in the previous works, the moment of impact is considered with a frame before minimum acceleration is reached, moment identified on the fist’s trajectory projection on the horizontal plane, when there appears a sudden change in the fist’s displacement).

**Results**

Using the methodology presented before (Băițel & Deliu, 2013; Băițel et al., 2015). After calculating the fist’s speed we achieved a graphic representation of its variation in time for all the 10 strikes (fig. 1). After synchronizing the strikes we calculated the medium speed of the fist and we represented its variation in time. We recorded a maximum value of the fist of 11.2 m/s and a maximum value of the medium speed of the 10 hits of 10.85 m/s.

![Fist's velocity variation in time](image)

**Fig. 1. Fist’s velocity variation in time**

Computing fist’s acceleration and representing in a graphical form its variation in time we receive information about the fist’s velocity variation in time and the minimum value for the acceleration (in fact, the deceleration) which provides information about the moment in which the fist reaches the target even if we didn’t do direct measurements regarding the impact.

![Fist's acceleration variation in time](image)
Next we made the calculation and the graphic representation of the intersegmental angle’s variation in time. We obtained the following situation (fig. 3).

Starting from a minimum flexion of 59.3°, the maximum extension of the elbow was of 132.8°, whilst the arm’s maximum angle with the vertical was of 49.9°. We followed the fist’s positional variation on the vertical.

It can be observed the fact that the guard position before the beginning of the strike was quite low (1.10 – 1.20 m), and the position of minimum height is somewhere around 80 cm. It must be reminded the fact that the participant has a height of 1.63 m.

The hip and the shoulder go down simultaneously, which show that the sportsman does not bend during the execution, but flexes his right knee. From the maximum height of the hip, of 0.931 m, it is recorded a decrease until 0.815 m (medium value).

Following the hip and shoulder’s line variation in time (fig. 5), we observe the fact that the upper part of the body works together with the lower one, which, practically, dictates the movement. In the moment of impact, the hip and shoulder’s line values are approximately equal (98,4 and 95,2°).
We take as an example a strike in order to illustrate the way in which the segments work for delimitating the movement’s sequences, as we also did in the case of the cross and direct punches. In this way, if we look at the fist’s speed variation in time, concomitant with the intersegmental angle’s evolution (fig. 6), we can observe that the movement begins in the hip. At the beginning, the shoulder’s line decreases, this being the preparing phase.

Fig. 6. Intersegmental angles and fist’s velocity in uppercut punch

The shoulders act in the same way. In this phase, the B angle formed by the arm with the vertical decreases, and the A angle, of the elbow’s extension, decreases a bit, then it starts to increase. This increase of the elbow’s extension angle will continue until the reach of the optimal value which assures the maximum muscular force of the arm’s muscles. The significant increase of the fist’s speed appears in the moment in which the shoulder’s line rises significantly. In other words, the shoulder’s implication gives speed to the strike, whilst the implication of the hip offers it force. We further present the shoulder, hip and fist’s height variation, concomitant with the fist’s acceleration variation. This fact allows us to report the movement to the moment of impact. The moment of impact precedes the moment in which the minimum acceleration is recorded. (fig. 7).
Discobolus – Physical Education, Sport and Kinetotherapy Journal Vol. XIII no.1 (47), 2017

Fig. 7. Correlation between segment's vertical movement and fist's acceleration

The minimum and maximum height of the segments as well as the difference between them are all represented in table 1.

Table 1. The segment’s vertical coordinates in uppercut punch

<table>
<thead>
<tr>
<th></th>
<th>z right hip [m]</th>
<th>z right shoulder [m]</th>
<th>z right fist [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>max value</td>
<td>0.884</td>
<td>1.334</td>
<td>1.251</td>
</tr>
<tr>
<td>min value</td>
<td>0.822</td>
<td>1.239</td>
<td>0.796</td>
</tr>
<tr>
<td>difference</td>
<td>0.063</td>
<td>0.095</td>
<td>0.455</td>
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</table>

At the beginning of the movement there is recorded a decrease of $z$ for hip, shoulder and fist. The lifting movement of the hip as well as of the fist begins before the impact, the whole body preparing for it. The higher level difference of the shoulder towards the hip indicates a slight bend of the torso in the moment of the hit, but the value is so low that it cannot be the case of a bad execution.

In table 2 we represent the temporal marks that were identified and the kinematic parameters calculated according to it for all the monitored uppercut hits. We will use the following notations:

- $t_0$ – the beginning of the movement (marked by the beginning of the continuum increase of the hip’s line),
- $t_1$ – the beginning of the explosive movement of the shoulders (marked by the moment in which the curve’s slope shoulder’s line increases),
- $t_2$ – the moment in which the fist’s maximum speed is reached,
- $T_1 = t_1 - t_0$,
- $T_2 = t_2 - t_1$,
- $T = t_2 - t_0$,
- $L$ – the length of the fist’s trajectory run in the time interval $t_0 - t_2$,
- $L_1$ – the length of the fist’s trajectory run in the time interval $t_1 - t_2$,
- $d$ – the distance run by the fist in the time interval $t_0 - t_2$,
- $d_2$ – the distance run by the fist in the time interval $t_1 - t_2$,
- $v_{max}$ – the fist’s maximum velocity,
- $v_2$ – the fist’s medium speed in the time interval $t_1 - t_2$,
- $\alpha$ – the value of the right elbow’s extension angle in the moment in which the fist reaches its maximum velocity,
- $\beta$ – the value of the right arm’s angle with the vertical in the moment in which the maximum speed is reached,
- $z_{fist}$ – the difference between the fist’s $z$ coordinates in the moments of time $t_0$ and $t_2$,
- $z_{hip}$ – the difference between the hip’s $z$ coordinates in the moments of time $t_0$ and $t_2$,
- $z_{sho}$ – the difference between the shoulder’s $z$ coordinates in the moments of time $t_0$ and $t_2$.

Table 2. Cinematic parameters for uppercut punches

<table>
<thead>
<tr>
<th>$T_1$ [s]</th>
<th>$T_2$ [s]</th>
<th>$T$ [s]</th>
<th>$L$ [m]</th>
<th>$L_1$ [m]</th>
<th>$d$ [m]</th>
<th>$d_2$ [m]</th>
<th>$v_{max}$ [m/s]</th>
<th>$v_2$ [m/s]</th>
<th>$\alpha$ [°]</th>
<th>$\beta$ [°]</th>
<th>$z_{fist}$ [m]</th>
<th>$z_{hip}$ [m]</th>
<th>$z_{sho}$ [m]</th>
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<tbody>
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<td>0.975</td>
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<td>0.476</td>
<td>9.96</td>
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<tr>
<td>0.16</td>
<td>0.1</td>
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<td>1.196</td>
<td>0.814</td>
<td>0.624</td>
<td>0.618</td>
<td>10.95</td>
<td>8.5</td>
<td>103.9</td>
<td>33.6</td>
<td>0.889</td>
<td>0.808</td>
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</tr>
<tr>
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<td>0.596</td>
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<td>0.842</td>
<td>0.811</td>
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<tr>
<td>0.2</td>
<td>0.11</td>
<td>0.31</td>
<td>0.974</td>
<td>0.704</td>
<td>0.604</td>
<td>0.508</td>
<td>11.02</td>
<td>6.4</td>
<td>104.8</td>
<td>23.1</td>
<td>0.864</td>
<td>0.836</td>
<td>1.254</td>
</tr>
<tr>
<td>0.16</td>
<td>0.1</td>
<td>0.26</td>
<td>1.014</td>
<td>0.663</td>
<td>0.524</td>
<td>0.428</td>
<td>10.85</td>
<td>6.63</td>
<td>108.1</td>
<td>26.7</td>
<td>0.814</td>
<td>0.832</td>
<td>1.247</td>
</tr>
</tbody>
</table>

Discussions and conclusions

It is already known the fact that the studies on the striking techniques’ biomechanics represent a very small percentage of the total studies on the large domain of martial arts and combat sports. Even more, the data that there
is on uppercut is not by far as rich as it is on the direct punch (cross and jab) or circular (swing, hook). That is why, we think that our study is welcomed in the idea of presenting objective information about this technique, executed by the 63 kg kick-boxing champion. Using the MOVEN equipment we managed to precisely delimitate the movement’s sequences. In this way, we identified a slow stage of arming, or of preparing the body’s segments for the strike (which lasts 0.16 -0.2 s) and one explosive (0.1 – 0.12 s), in which the fist’s accelerated movement takes place and the impact with the target. The fist’s maximum speed reached values between 9.96 – 11.6 m/s, and the distance run by the fist in the monitored executions was of 0.48 – 0.68 m. The arm’s angle with the vertical in the moment of impact was somewhere between 23 - 33° (there was a single value of 45° recorded), which demonstrates the fact that the force and speed of the uppercut strike come from the chaining of the sequences of pushing in the ground with the leg on the striking hand’s side, the hip and torso’s rotation, the involvement of the shoulder at the right moment and the moderate extension of the elbow (smaller values than 120° in the moment of impact).

References


MUSCULOSKELETAL DISORDERS ETIOLOGY AND INCIDENCE AMONG DENTISTS IN CRAIOVA

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Abstract. Musculoskeletal disorders are very common occupational health problems among dental practitioners. The aim of this study is to evaluate the incidence of this illness among dentists of Craiova, and to investigate the etiology of musculoskeletal disorders. Methods: A self-reported questionnaire was delivered to a random sample of 102 dentists during two months, November and December 2015. The questionnaire includes 17 questions, separated in two parts: one general part about age, gender, specialty, years of experience, and the second part including questions about working postures, symptoms experienced in the last 24 months, the most affected areas, and the treatment followed. Results: The mean age was 35.9±4.9, with 78% females, and 22% males. 38.24% of dentists use no ergonomic position during work, orthostatic, and a high percent of practitioners, 78.43%, bend and twist in order to get some better access to the oral cavity. The study shows that 91.17% of dentists experienced symptoms in the last 24 months, most of them, 58.33%, localized in the cervical, thoracic and lumbar regions, and only 31.37% of them followed treatment. Conclusions: The incidence of MSD in dentist is high, especially in neck and back areas, and the frequency of symptoms can correlate especially with incorrect positioning during work. Prevention programs for work related injuries in dental practice are needed, in order to reduce specific risk factors, so as to improve the practitioners’ health.

Keywords: musculoskeletal disorders; questionnaire; dentists; ergonomic; risk factors.

Introduction

Despite the modern equipment design in dentistry, most dental practitioners still suffer for occupational health problems (Leggat et al., 2007; Lehto et al., 1991).

Dentistry is a demanding profession, which requires good visual and acoustic acuity, psychomotor skills, and the ability to resist to a long period of physical effort (Muralidharan et al., 2013; Finisen et al., 1998, Zaheda &Mohammad, 2011).

The concept of ergonomics has been applied to dentistry in order to help dentists to prevent occupational injuries, improve their productivity, and reduce stress (Rundcrantz et al., 1991).

The concentration and the precision assumed by dentists during their clinical activity, require many body muscles to contract to prolonged static postures, leading to musculoskeletal disorders (Khalid et al., 2001; Milerd &Ekenvall, 1990). MSD is one of the most common illnesses worldwide, and causes pain, disability, discomfort, and reduces performance (Muralidharan et al., 2013; Alexopoulos et al., 2004). Besides the physical complaints, MSD also determine psychological and social troubles for dental practitioner(Khalid et al., 2001).

The mean ergonomic concept in dentistry is to adopt optimal working positions and to correct postures throughout the execution of treatment acts. (Marshall et al., 1997; Chowanadisai et al., 2000; Jacobsen et al., 1991). However, Christensen and Finsen (1994) demonstrate that there is no evidence to sustain a better health status for four handed position users.

Many studies have shown a high prevalence of MSD among dentists, caused or increased by repeated movements, frequent use of vibrations, improper positioning, prolonged exertions, or lack of repose (Lindfors et al., 2006; Hayes et al., 2009; Morse et al., 2010; Ratzon et al., 2000).

Despite the frequent presence of occupational hazards, only few dentists seek for medical therapy to improve the well-being of their life(Leggat and Smith, 2006). Since the prevalence and the incidence of working health problems in dental practice is not well documented, the aim of this study is to evaluate the prevalence of MSD among dentists in Craiova town.

Materials and methods

A descriptive study was conducted during November and December 2015, aiming to assess the prevalence and the risk factors of MSD among dentists in Craiova. A self-administered questionnaire was handed over to 102 dental practitioners in their clinics. The questionnaire was similar with those used by other studies, and the results
were comparable (Alexopoulos et al. 2004; Leggat &Smith 2006; Zaheda &Mohammad, 2011; Udoye &Aguwa, 2006). This is an epidemiological descriptive, observational non-experimental study.

Prior to the study, the questionnaire was pre-tested for comprehensibility, practicability, and relevance to a random sample of 25 dentists; they have understood the content and validated it.

The questionnaire received ethical clearance from the University of Craiova Ethical Committee. A pre-emptive article about the methodology and validity of the questionnaire, describing our forthcoming study, was published in Universitaria, shortly before this study began (Rosulescu et al., 2016). The questionnaire includes information regarding musculoskeletal symptoms in the previous 24 months. It contains 15 questions separated in two parts: a general questionnaire, and a more specific questionnaire (table1).

Table 1. The questionnaire

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>F</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job history</td>
<td>0-5 years</td>
<td>5-10 years</td>
<td>More than 10 years</td>
</tr>
<tr>
<td>How many hours you work per week?</td>
<td>Less than 20 hours</td>
<td>Between 20-40 hours</td>
<td>More than 40 hours</td>
</tr>
<tr>
<td>Which is the Work position adopted</td>
<td>Orthostatic</td>
<td>Sat. patient seated</td>
<td>Four handed</td>
</tr>
<tr>
<td>Do you bend/twist excessively for better access to oral cavity?</td>
<td>yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Do you repose after each treated patient?</td>
<td>yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Did you experienced symptoms: pain, muscle tensions, fatigue, and discomfort in the previous 24 months?</td>
<td>frequent</td>
<td>Occasionally</td>
<td>no</td>
</tr>
<tr>
<td>Which were the risk factors for these symptoms?</td>
<td>Repetitive movements, demanding for upper limbs</td>
<td>Frequent use of vibration hand pieces</td>
<td>Incorrect postures of the body</td>
</tr>
<tr>
<td>Which was the location of the symptoms?</td>
<td>Head/neck</td>
<td>Cervical/thorax/lumbar</td>
<td>Shoulder/elbow/hand</td>
</tr>
<tr>
<td>How often you experience the symptoms</td>
<td>Once a week</td>
<td>Once a month</td>
<td>Once every three months</td>
</tr>
<tr>
<td>How symptoms interfere with daily activities at work and during leisure time?</td>
<td>mostly</td>
<td>Slightly</td>
<td></td>
</tr>
<tr>
<td>Did you sought for medical assistance for the symptoms?</td>
<td>yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>What treatment did you followed</td>
<td>Medical therapy</td>
<td>rehabilitation exercises</td>
<td>physiotherapy</td>
</tr>
<tr>
<td>Do you practice physical activities in your daily routine?</td>
<td>frequent</td>
<td>Occasionally</td>
<td>No</td>
</tr>
</tbody>
</table>

Results

102 dental practitioners responded to the questionnaire, 22% males, and 78% females. Mean age was 35, 9% (±4, 9). The distribution for the number of years of working by gender is given in table 2.

Table 2. Years of work by gender

<table>
<thead>
<tr>
<th>Years of work</th>
<th>males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5 years</td>
<td>6,86%</td>
<td>23,33%</td>
</tr>
</tbody>
</table>
Regarding weekly working hours, 33.33% of dentists work less than 20 hours per week, 59.80% work between 20-40 weekly hours, and only 6.86% work more than 40 hours weekly (fig. 1).

![Weekly working hours chart]

**Fig. 1. Percent of weekly working hours**

A high percent of practitioners, 91.17%, reported frequent or occasional musculoskeletal symptoms in the last 24 months. The prevalence of MSD stratified by the position adopted by dentists while working is shown in table 3.

<table>
<thead>
<tr>
<th>Working position</th>
<th>Frequent symptoms</th>
<th>Occasional symptoms</th>
<th>No symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing</td>
<td>19.61%</td>
<td>27.45%</td>
<td>0.98%</td>
</tr>
<tr>
<td>Sit down, patient seated</td>
<td>9.80%</td>
<td>7.84%</td>
<td>0.98%</td>
</tr>
<tr>
<td>Four handed</td>
<td>0.98%</td>
<td>4.90%</td>
<td>2.94%</td>
</tr>
<tr>
<td>Alternating</td>
<td>0.98%</td>
<td>19.61%</td>
<td>3.92%</td>
</tr>
</tbody>
</table>

The highest percent of symptoms was obtained in dentists adopting standing position in clinical practice, while the lowest percent of symptoms was reported by dentists working in four-handed position or alternating positions in their daily practice. The results shown 78.43% of dentists having excessively bending and twisting in order to gain better access to the treated area (fig.2).

![Do you bend/twist excessively? chart]

**Fig. 2. Bending/Twisting while working**
Most dentists, 79, 41%, affirmed they don’t repose between patients (fig.3).

![Do you repose after each treated patient?](image)

Fig. 3. The repose between patients

About the risk factors responsible in MSD’s occurrence, 62, 94% of the answers refer to incorrect positioning, 14, 69% to prolonged exertions, and 8, 39% to repeated movements, and only a low percent is attributed to frequent use of vibrations or to the lack of repose (fig.4).

![Risk factors in MSD occurrence](image)

Fig. 4. Risk factors in MSD occurrence

Regarding the most affected sites of the body with musculoskeletal disorders, the results are shown in table 4.

<table>
<thead>
<tr>
<th>Area</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head/neck</td>
<td>23.33%</td>
</tr>
<tr>
<td>Cervical/thorax/lumbar</td>
<td>58.33%</td>
</tr>
<tr>
<td>Shoulder/elbow/hand</td>
<td>8.33%</td>
</tr>
<tr>
<td>Hip/knee/ankle</td>
<td>10%</td>
</tr>
</tbody>
</table>

For the question: “How often do you experience the musculoskeletal symptoms?” the answers are shown in Fig. 5.
We also asked dentists how symptoms interfered with their daily activities. Only 21, 57% of clinicians affirm the symptoms greatly affect their life, and the rest of 78, 43% are slightly affected.

Only 31, 37% of the practitioners followed medical therapy for the professional injuries, and the results by type of treatment are shown in table 5.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Number of answers</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical therapy</td>
<td>36</td>
<td>61,02%</td>
</tr>
<tr>
<td>Rehabilitation exercises</td>
<td>15</td>
<td>25,42%</td>
</tr>
<tr>
<td>Physiotherapy</td>
<td>8</td>
<td>13,56%</td>
</tr>
<tr>
<td>Surgical therapy</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Of the 59 practitioners affirming they undergone any treatment in the last 24 months, 61, 02% followed medical therapy, 25, 42% physiotherapy, and none of them had surgical therapy.

Regarding the question "How often do you exercise/ play sports?", only 19, 61% of dentists affirm they often practice physical activities, and 50, 98% of them occasionally practice sports.

Discussions and conclusions

In Romania the prevalence of MSD among dentists is not well documented, although most dentists complain often of discomfort, pain, fatigue in their daily practice (Leggat et al., 2007; Khalid et al., 2001; Lehto et al.,1991).

This study aims to evaluate the prevalence of MSD among dentists in our town. The literature studies reveal a high prevalence of musculoskeletal symptoms among dentists, the results obtained by other countries being similar with those found by our study (Jacobsen et al., 1991; Lehto et al.,1991, Lindfors et al., 2006).

As many authors have revealed, the most important risk factor in musculoskeletal disorders occurrence is the incorrect posture adopted by dentists (Udo & Aguwa, 2006). Most dentists use standing position in their daily working practice. The standing position brings awkward bending, twisting and reaching, therefore placing stress on the musculoskeletal system, leading to pain and discomfort.

Dental practitioners working in alternating positions in their clinical activity seem to have less MSD(Milerad &Ekenvall, 1990; Marshall et al., 1997; Christensen &Finsen, 1994).

In our study most dentists, 91, 17%, reported at least one musculoskeletal symptom in previous 24 months. The results were similar with those found by other studies from many other countries (Finisen et al., 1998; Chowanadisai et al., 2000; Hayes et al., 2009; Udoye &Aguwa , 2006; Ratzon et al., 2000).

The current study also evaluated the distribution of symptoms to different sites of the body, revealing the neck and low back, as the highest prevalence of symptoms (Morse et al., 2010; Khalid et al. 2001). Associations between risk factors and musculoskeletal complaints are significantly revealed in this study. The most incriminated risk factor for the occurrence of pain, discomfort, and fatigue to neck, back or hands is the incorrect
posture adopted by dentists in the clinical practice (Rundcrantz et al., 1991; Milerad & Ekvall, 1990; Alexopoulos et al., 2004).

Also repetitive movements, prolonged exertions, use of vibrations are considered to be risk factors responsible for the occurrence of MSD (Morse et al., 2010).

The percent of dentists seeking for medical assistance in previous 24 months for musculoskeletal injuries, 31, 37%, is similar with those obtained by other authors, from other countries (Leggat & Smith, 2006).

This study warns about the importance of adopting ergonomic principles in dental practice, in order to maintain good health for the practitioners, especially by using proper postures in the daily practice.

The high prevalence of MSD among dentists is a fact to take in consideration, aiming to imagine preventive programs for the practitioners, in order to reduce the occupational hazards, therefore improving the well-being of dental staff.

Acknowledgements

We are grateful to all the dentists who completed our questionnaire.

Conflict of interests

All authors had equal contributions.

References


METHODOLOGICAL CONTRIBUTIONS CONCERNING THE IMPULSE POWER DEVELOPMENT IN TERMS OF MOBILITY

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Abstract. Problem statement. The impulse power of the lower limbs assisted by the mobility of the ankle joint favors/limits the sportive performance in 400 m hurdles. We considered that by using the neuromuscular control method in order to improve the impulse power of the lower limbs, corroborated with the development of ankles joint mobility, by using the training technology of the conditions simulator type II, as a complementary way to the other training methods and means, we will be able to optimize its level and the performance obtained in competition. Propose of study: The aim of this research is the optimization of the training methodology regarding the development of the impulse power of the lower limbs, assisted by the mobility at the ankle joint level, in 400 m seniors hurdlers, in order to improve the event performance. Findings and Results, and Conclusions. A case study was carried out, two neuromuscular exercises were used with the conditions simulator: the hip lifting in horizontal plan and the planar extension of the ankle joint, on both legs, during three months, two trainings/week. The results are emphasizing the increasing of the values specific to the muscular power during the impulse motion, on both legs, as well as the improvement of the performance in 400 m hurdles, for the participant.

Keywords: impulse power; neuromuscular control; performance.

Introduction

Performance athletes training is focused on the development of a teaching strategy where the working methodology is an essential element in achieving the objectives. Training methodology is "a set of methods, means and techniques of training, education and recovery of the body after exercise, used in the context of the aimed targets and especially by the sports performance" (Nicu, 1993, p. 21).

The 400 m hurdles is the most complex sprint event in Athletics due both, the high technical and physical training level that is required. Domain experts are united in supporting the allegation that among physical fitness factors that favors / limits the performance in this event, the most important is the impulse power of the lower limbs during specific running over and between the hurdles (Alexandrescu, TatuundArdelean, 1978, p. 143; Țifrea, 2002, p. 202; Mihăilescu, 2005, p. 176; Mihăilescu & Mihăilescu, 2006, p. 139).

The neuromuscular control that is necessary to achieve effective movements is made on three levels: the superior level - neocortex and basal nucleus; the middle level - cerebral and motor cortex; lower level - brainstem and spinal cord, with distinct roles in the motor task achievement (Ristoiu and Marcu- Lapadat, 2004, p. 156). The classical training means used in order to develop muscle strength limits its improvement, in terms of specificity, because of the fact that these are regarded only for the kinematic chains training (Zatsiorsky, 1995, p. 159).

The condition simulator called Ergosim facilitates the neuromuscular control at all levels by specific feedback that the athletes can have it in their training methodology (Hillerin, Schor & Stupineanu, 1996).

The research purpose is to bring a methodological contribution in the impulse power development of lower limbs while developing the ankle joint mobility, at the 400 m hurdles senior runners, in order to increase the performance during this event.

Research hypotheses. We considered that if we will use neuromuscular control method for impulse power development of the lower limbs by using the simulator training conditions type II Ergosim, complementary to the other methods and means of training, we will optimize its level and the performance during the event.

The combinations of impulse power developing of the lower limbs and the ankle mobility development objective on both feet of the 400m runner by using the visual feedback will determine the growth of the specific strength level, facilitating the improvement of the performance during competition.

Materials and methods

In order to achieve the research purpose we have established the objectives, the tasks, the research methods and investigation technology. We studied the possibilities of using Ergosim condition simulator in order to provide the neuromuscular control in velocity effort characterized by strength during the specific impulse of the 400 m hurdles event.

In order to verify the working hypothesis we achieved an experimental case study, the participant being an athlete called T.G. During this experiment he had a first testing of the ankle joint extension and forward oscillation of the thigh in horizontal plan, on both lower limbs on the condition simulator. Based on the motion dynamics...
achieved by the athlete on both movements as well as on the strength level we have developed the training program on simulator. This program was integrated in the specific general training program in order to achieve, the two objectives that were simultaneously approached: the improvement of the impulse power of the lower limbs and the development of the ankle joint mobility.

The experimental research was conducted between 4.02 - 22.04.2015. The experiment procedure was focused on practicing twenty repetitions per set in 4 sets for each lower limb (limb and ankle). The working time lasted between 2 - 3 minutes for the thigh oscillation in horizontal plan and 1 - 2 minutes for the plantar extension of the ankle with a break between sets of 2 minutes maximum. The sets were done alternatively for each limb working twice a week. During the experiment recommendations were made concerning the optimization of training methodology, taking into account the results from the intermediate testing, the specific hurdles trainings and the assessment tests.

Results

In table 1 is presented the dynamic of the results obtained during the three tests performed at the ankle joint and thigh oscillation, emphasizing the statistical indexes. The table is followed by two graphics where we can observe the dynamic of the strength control level and the length of the motion from the initial (T₁) and final testing (Tₚ).

Table 1. The dynamic of the position and strength during the right ankle joint extension

<table>
<thead>
<tr>
<th>Statistical indexes</th>
<th>Initial Testing</th>
<th>Intermediate Testing</th>
<th>Final Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position Right (PR) (M)</td>
<td>Strenght Right (Sr) (Dan)</td>
<td>Position Right (PR) (M)</td>
<td>Strenght Right (SR)(DAN)</td>
</tr>
<tr>
<td>X</td>
<td>0.122</td>
<td>2,729</td>
<td>0.125</td>
</tr>
<tr>
<td>S</td>
<td>± 0.071</td>
<td>± 1,651</td>
<td>± 0.074</td>
</tr>
<tr>
<td>C.V. (%)</td>
<td>58,798</td>
<td>60,515</td>
<td>59,672</td>
</tr>
</tbody>
</table>

Fig. 1 and 2. The dynamic of the strength control level and the length of the motion during the right ankle joint extension–T₁ /Tₚ

The statistical indexes that were calculated for all the repetitions performed reveals that from T₁ to Tₚ he succeeds in a better control of the motion, the length of the motion increases with 0,015 m, the amplitude of the motion has an ascendant trajectory based on strength increasing from 2,729 daN to 2,925 daN. The standard deviation and variability coefficient have a decreasing trend in strength index but the repetitions are performed in terms of variation.
Table 2. The dynamic of the position and strength during the left ankle joint extension

<table>
<thead>
<tr>
<th>Statical index</th>
<th>Initial testing</th>
<th>Intermediate testing</th>
<th>Final testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Position Left</td>
<td>Strengh Left</td>
<td>Position Left</td>
</tr>
<tr>
<td></td>
<td>(Pl) (M)</td>
<td>(Sl) (Dan)</td>
<td>(Pl) (M)</td>
</tr>
<tr>
<td>X</td>
<td>0,125</td>
<td>2,734</td>
<td>0,130</td>
</tr>
<tr>
<td>S</td>
<td>± 0,074</td>
<td>± 1,696</td>
<td>± 0,080</td>
</tr>
<tr>
<td>C.V. (%)</td>
<td>59,333</td>
<td>62,045</td>
<td>61,865</td>
</tr>
</tbody>
</table>

Fig. 3. and 4. The dynamic of the strength control level and the length of the motion during the left ankle joint extension – \( T_i / T_f \)

Similar as table 1, in table 2 are presented the values of the same indexes for the left plantar ankle joint extension. We found that there are no significant differences between the two limbs in this exercise. These aspects reflect a good specific training from the perspective of the event performed by our participant in the study. The graphics are emphasizing the motion amplitude and the strength oscillations of each repetition from the model and they underline the good effects of the neuromuscular control trainings performed during experiment.

In tables 3 and 4 are presented the statistical indexes obtained after the athlete performed the forward thigh oscillation in horizontal plan on the lower limbs, right and left.

Table 3. The dynamic of the position and strength during the forward oscillation of the right thigh in horizontal plan

<table>
<thead>
<tr>
<th>Statical index</th>
<th>Initial testing</th>
<th>Intermediate testing</th>
<th>Final testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Position right</td>
<td>Strengh right</td>
<td>Position right</td>
</tr>
<tr>
<td></td>
<td>(pr) (m)</td>
<td>(sr) (dan)</td>
<td>(pr) (m)</td>
</tr>
<tr>
<td>X</td>
<td>0,489</td>
<td>2,882</td>
<td>0,544</td>
</tr>
<tr>
<td>S</td>
<td>± 0,316</td>
<td>± 1,834</td>
<td>± 0,361</td>
</tr>
<tr>
<td>C.V. (%)</td>
<td>64,672</td>
<td>63,654</td>
<td>66,363</td>
</tr>
</tbody>
</table>

The data from table 4 presents the averages of the dynamics parameters determined during the forward oscillation of the right thigh in horizontal plan (motion that is similar to the one performed during the running step). In what concerns the position, the values dynamics presents an average of 0,489 m in initial testing, 0,544 m in the intermediate one and 0,520 m for the final testing. Referring to the strength dynamics, the results of this parameter are emphasizing an average of 2.882 daN in initial testing, 2,639 daN in intermediate testing and a value of 2,715 in final test.
Fig. 5 and 6. The dynamic of the strength control level and the length of the motion during the forward oscillation of the right thigh in horizontal plan – $T_1/T_F$

Figures 5 and 6 present the way how the athlete steps forward from initial to final testing, noticing the obvious improvement of neuromuscular control movement both at the beginning and during or the end of it.

Table 4. The dynamic of the position and strength during the forward oscillation of the left thigh in horizontal plan

<table>
<thead>
<tr>
<th>Statical indexes</th>
<th>Initial Testing</th>
<th>Intermediate Testing</th>
<th>Final Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Position left (pl) (m)</td>
<td>Strength left (sl) (dan)</td>
<td>Position left (pl) (m)</td>
</tr>
<tr>
<td>X</td>
<td>0,488</td>
<td>3,162</td>
<td>0,525</td>
</tr>
<tr>
<td>S</td>
<td>± 0.330</td>
<td>± 1,647</td>
<td>± 0.359</td>
</tr>
<tr>
<td>Cv(%)</td>
<td>67,683</td>
<td>52,082</td>
<td>68,398</td>
</tr>
</tbody>
</table>

Referring to the table 4 we can observe that in the position case the average presents a trajectory the is similar to the one recorder at the right thigh with values of 0,488 m for the initial testing, 0,525 m the intermediate and 0,509 m for the final testing. In what concerns the strength, the values were framed between 3,162 daN for the initial testing and 2,774 daN for the final one.

Fig. 7 and 8. The dynamic of the strength control level and the length of the motion during the forward oscillation of the left thigh in horizontal plan – $T_1/T_F$

Figures 7 and 8 show how the athlete achieves the improvement of the neuromuscular control from the initial to the final testing, being able to keep the strength level variations as close as possible to the required model.
Discussions and conclusions

The date presented in tables 1 to 4 are emphasizing the changes that have occurred during neuromuscular control trainings and they reflect the efficiency of using visual feedback in power improvement.

The values of the variability coefficient points out that during neuromuscular control training, the athlete has improved the quality of response to sensory stimuli, noticing lower values of this statistically indicator in different times of the tests.

In what concerns the growth of the motion amplitude, we can see an improvement to both motions of the lower limbs. This fact represents another argument regarding the efficiency of using visual feedback for neuromuscular control training of the power improvement in terms of mobility.

In figures 5 and 6 is represented the way the athlete succeeds in performing the forward oscillation of the thigh by controlling his strength ability. As we can see, there are visible differences between the initial (table 5) and final (table 6) testing in what concerns the manner that the athlete makes the motion from the binning until the end of it. If in the beginning of the initial testing the athlete records significant strength variations comparing with the indicated model (4daN), the curves oscillating between 4 daN and 5 daN, with a tendency of closeness to the superior value, in the final testing he manage to coordinate his sensorial system so as, the strength variations are being reduces as value. This is reflected in the closeness of the graphic curves around the model, 4 daN. Also, we can see that, during the initial testing, the athlete has difficulties in concentrating the strength level around 4 daNat the beginning of motion, aspect that is improved and, in the final testing is revised.

The graphical representations of the neuromuscular control level that are emphasized in graphic 7 and 8 means also an improvement of the sensorial system in the similar parameters founded in graphics 5 and 6.

By comparing the two initial testing of the forward oscillation for left and right lower limb, we can observe a difference of sensorial expression in on behalf of left leg, the athlete being capable of smaller variations of strength comparing with the required model. In the case of the final testing, he manages an improvement of the neuromuscular control for both legs, the repetitions being concentrated around the required model.

The top world athletes are running the distance between the hurdles of the 400 m hurdles event in 12-14 running steps in male events and 14-16 running steps in female event. The thing indicates a very good impulse power that is reflected in the running rithm.

From the experimental research we can see a qualitative improvement of the results obtained by working on the condition simulator called ERGOSIM in what concerns the specific exercises that were adjusted to the event and elaborated and performed in order to verify the working hypothesis. It has been experimental demonstrated that, in T.G. case, the using of the simulator conditions as mean and method of complementary training of the 400 m hurdles runners has determined the optimization of the performance. The performances improvement reached in competition, during the competition period, it has been achieved also based on the optimization of the neuromuscular control, velocity in terms of strength that is characteristic to the specific impulse of the 400 m hurdles running.

Based on direct pedagogical observation and the proprioception of the athlete it was found that he is able to achieve a better control of his velocity, he has a plus of strength in terms of endurance by comparing it with the same period of the previous year. The participant has demonstrated a better control of the running rhythm between hurdles, based on a redress of the impulse motion and the increase of the impulse power of the lower limbs and ankles joints mobility.

References
STUDY ON ASCERTAINING THE REPORT OF EMOTIONALITY VERSUS RATIONALITY IN THE HANDBALL GAME

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Abstract. This paper is a study aimed at identifying ascertaining emotionality and rationality report for the handball players. The research participants were 75 handball players, male, components of the first 2 teams from national leagues. Athletes were chosen in equal numbers for each position in the field. It was applied a battery of specific psychological tests which led to obtaining different results between categories of athletes investigated. It was revealed that two categories of participants had a predisposition to act in a manner (generally) rational and more emotional the other categories. The overall conclusion of this study is that rationality-emotionality report of the handball players investigated it is conditioned by the specific characteristics and different tasks of the game for each group of players.

Keywords: emotionality; rationality; handball players;

Introduction

In professional sports, achieving notable results it is conditional on the control of multiple relevant variables to achieve performance. In the current phase, in most cases, the level of multilateral physical training and technique is similar for most top athletes, the differences between them are determined often by psychological factors. Given that, the game of handball is a very dynamic sport due to sudden alternations between phases of attack and defense, movement of the ball and players, all taking place in a system of complex effort (handling the ball under resistance regime of speed, skill and power system), for which athletes require increased resources from physical (biological), and specific psychological readiness. In this regard, knowledge and control an extent as possible, the report between emotionality and rationality can be the important retail between winning or losing a tournament.

Although between cognitive and affective processes there are multiple interconnections, which are essentially two complex systems of the human mental system (Hackfort, 2007), differential treatment both the theoretical and practical allowing a proper understanding of meanings and the implications thereof sports sphere.

Emotionality involves "mastering emotions, the detection the relationship between feelings and actions, emotions productive use and positive control of their learning and emotional empathy ability to solve problems through interpersonal communication" (Mihuț, 2009, p. 335).

As it can be grasped in the quotation previously presented, the main feature of emotionality is really emotional control and emotional regulation. According to some authors (Gross, 2002; Vrasti, 2015, p. 13), the great challenge of every human life is to enhance our ability to control emotions, something that requires a set of default actions: awareness of their classification, routing and modifying them to achieve the objectives due to actions we perform.

In a synthetic approach, rationality is concerned with goals and objectives that the individual wants to achieve, all this closely related to selecting optimal means by which to accomplish predetermined goals.

The Whole Brain Model, developed by Herrmann and his team, (Herrmann, 1996; Roco, 2004, p. 50) treats and explains in an inclusive manner rationality and emotionality through functional peculiarities and meanings of dominance of the cerebral hemispheres.

Thus, the human brain is analyzed metaphorically on four sectors, two (left and right cortical) representing support rational component, and the other two (left and right limbic) for the affective. According to the percentage activation of each quadrant is shaping a hemispheric profile for each individual.

Based on this theoretical system was developed by the same author a psychological test (HBDI test) and an adapted version thereof, and complemented by other research led to the creation of a new specific instrument approach developed by Prof. Roco. M. We note that this psychological test was used in the present paper.
Materials and methods

Research participants were 75 male handball players, senior level, members of teams from Romania, the first two national leagues. We selected 15 athletes for each post game: goalkeepers, backcourt players, far players, centers players and pivots players. To identify the report emotionality – rationality, we used two psychological tests (Roco, 2004), as follows:

A. Questionnaire actionable items is a specific and complex instrument that identifies:
- Dominance functional cerebral hemispheres (left / right);
- The percentage of activation of brain quadrants: right cortical, left cortical, limbic right and left.
- They each have certain specializations and associated values have adapted meanings;
- Values expressing the relationship between rationality - emotionality based on knowledge of brain quadrants.

B. Test proverbs which determines the predominant reaction (rational or emotional) and contains 50 items.

These psychological tests were applied once, followed later by a stage of processing and interpretation of results.

Results

Table 1. Results obtained statistically after application the questionnaire actionable items on Rationality component to the handball players

<table>
<thead>
<tr>
<th>No. issue</th>
<th>Post game in handball</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>correlation</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Backcourt players</td>
<td>74,6</td>
<td>3,1</td>
<td>0,4</td>
<td>6,05</td>
<td>&lt;0,001</td>
</tr>
<tr>
<td></td>
<td>Far players</td>
<td>68,9</td>
<td>3,6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Backcourt players</td>
<td>74,6</td>
<td>3,1</td>
<td>0,05</td>
<td>0,68</td>
<td>&gt;0,5</td>
</tr>
<tr>
<td></td>
<td>Centers players</td>
<td>73,9</td>
<td>2,2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Backcourt players</td>
<td>74,6</td>
<td>3,1</td>
<td>0,5</td>
<td>7,38</td>
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</tr>
<tr>
<td></td>
<td>Pivots players</td>
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<td>4,8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Backcourt players</td>
<td>74,6</td>
<td>3,1</td>
<td>0,03</td>
<td>6,16</td>
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<td></td>
<td>Goalkeepers</td>
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<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Far players</td>
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<td>3,6</td>
<td>0,4</td>
<td>4,67</td>
<td>&lt;0,001</td>
</tr>
<tr>
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<td>2,2</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>Far players</td>
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<td>3,6</td>
<td>0,1</td>
<td>1,71</td>
<td>&lt;0,5</td>
</tr>
<tr>
<td></td>
<td>Pivots players</td>
<td>66,3</td>
<td>4,8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Far players</td>
<td>68,9</td>
<td>3,6</td>
<td>0,1</td>
<td>2,36</td>
<td>&lt;0,5</td>
</tr>
<tr>
<td></td>
<td>Goalkeepers</td>
<td>65,3</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Pivots players</td>
<td>66,3</td>
<td>4,8</td>
<td>0,7</td>
<td>5,6</td>
<td>&lt;0,001</td>
</tr>
<tr>
<td></td>
<td>Centers players</td>
<td>73,9</td>
<td>2,2</td>
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<tr>
<td>9</td>
<td>Pivots players</td>
<td>66,3</td>
<td>4,8</td>
<td>0,4</td>
<td>0,8</td>
<td>&gt;0,5</td>
</tr>
<tr>
<td></td>
<td>Goalkeepers</td>
<td>65,3</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Results obtained statistically after application the questionnaire actionable items on Emotionality component to the handball players

<table>
<thead>
<tr>
<th>No. issue</th>
<th>Post game in handball</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>correlation</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Backcourt players</td>
<td>63,8</td>
<td>2,2</td>
<td>0,09</td>
<td>3,46</td>
<td>&lt;0,001</td>
</tr>
<tr>
<td></td>
<td>Far players</td>
<td>66,7</td>
<td>2,5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Backcourt players</td>
<td>63,8</td>
<td>2,2</td>
<td>0,2</td>
<td>1,24</td>
<td>&gt;0,5</td>
</tr>
</tbody>
</table>
Analyzing Table 1, it can be noted that for the component of Rationality, the elevated values belong to the handball players playing on posts: backcourt and center players. The differences are statistically significant when the two categories mentioned of athletes are compared with other groups of participants. The Emotional side is objectified in Table 2. The amounts included in the higher percentages in this regard are found in groups of athletes that play on posts: pivots, goalkeepers and far players. For each component investigated through this questionnaire it can be observed that the values are in the range 0-100%.

The report of Emotionality - Rationality obtained by applying the test (in Fig. 1) highlights a predisposition most significant for the emotional side registered by the players who usually play posts goalkeepers, pivots and extreme. For the latter mentioned is observed the nearest values to this report.

**Discussions and conclusions**

The first aspect that emerges as a result of conducting this study is that there is a clear link between posts on active handball players and activation levels on the axis rationality-emotionality. Obtained results reveal that in general the athletes who play on line of 9 meters (centers and backcourts) have a predominance to act and react in a rational manner. The predilection for this kind of approach we can say that is natural if we analyze the game tasks that they have. Center should coordinate team players to mark goals. This involves analyzing each situation of the game in part synchronizing the movement of the ball and players, the optimal timing for the initiation and conduct of tactical actions, responsibility for most actions undertaken by the team, both on their successes and failures. He must have some special qualities: sense of observation, perception of space-temporal, ability to be heard and listened easily, able to make correct decisions in a short time both for himself and for other players,
ability to analyze and synthesize the entire match, regardless of the situation in which the team is. Regarding the backcourt players, they generally have a big responsibility to score the most of the goals for their team. They are pragmatic, very attentive to opponents and to the goalkeeper.

The higher values reported on the component of emotionality revealed to the other categories of players reveal a relation between certain peculiarities determined by specific job tasks and the scores obtained as a result of the application of the battery of psychological tests. In this regard, we can mention that the first players which go on attack on phases I and II are particularly far and pivot players, which receive passes from the goalkeeper. For proper performance of these phases of attack is required: a great sense of the game, the ability to quickly and accurately sense the possible transition from defense to attack, the ability to feel without seeing (sometimes) where the direct opponent is in relation to their position. Knowing the propensity to act rationally or emotionally, and the significance of this, it can lead to the optimization of the training process and to improve the personal relationships within the team. Thus, the coach, knowing athletes from this perspective also, he can get a better understanding of mental functioning of his players, he will be able to adapt more correctly the training methods and to conduct knowing the individual characteristics of athletes. Also, staking tasks game official competitions will be fairer and more fully applied.

It is desirable that the results achieved by the battery of tests in this study to be correlated with other parameters: physical, technical, psychological, so as to obtain a complete image of athletes, express purpose of being able to control (as much as possible) all the variables that can lead to obtaining relevant sporting performance.

It can be seen from the analysis that the share values of rationality-emotionality axis activation are similar in both tests and distribution of scores around the mean value is relatively small which means homogeneity of those characteristics for the groups of athletes. The overall conclusion of this study is that rationality-emotionality report of the handball players investigated is shaped differently depending on the post game, issues results suggest that there is a determinism between this report and the specific tasks involved in the categories of athletes practicing this sports game.

Acknowledgements

Some of this research participants come from the group of the sportsmen which were the participants of thesis research of the first author.

References


THE CHARACTERISTICS SPECIFIC TO THE HIGH PERFORMANCE MALE VOLLEYBALL

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Abstract. The large differences between the men's volleyball at World / European and national level have multiple causes. Among them, we believe that the methodological training on physical training component is crucial. The knowledge of somatic and motor characteristics of the players of the best teams participating in the 2012 Olympics, can provide concrete benchmarks in shaping the physical training of the players on the national team positions. We aimed to identify the somatic and the lower limbs explosive force parameters during the attack strike and blockage recorded by the best teams of the 2012 Olympic Games edition and our national team. In order to argue our research approach we determined the linear correlations between the waist and the height of jumps on the two specific skills. To verify the hypothesis we used the documentation method and math-statistical method. Analyzing the parameters by comparison to the top teams and those of Romania, we found that although the recorded anthropometric indexes are quite close the results of the two jumps are significantly lower in Romanian team. At the attack strikes the differences are as follows: -18 cm than Bulgaria, -16 cm than Russia, 14cm than Italy, 10cm than Brazil. At the blockage jump Romanian team has a deficit of 17cm to Bulgaria, 15cm to Russia, 9 cm to Italy and 4 cm to Brazil. This highlights a very weak level of the specific physical training concerning the expansion ability, to Romania men's volleyball team components and requires a rethinking of the specific physical training. It has been confirmed the working hypothesis and can be established objective benchmarks of specific physical training concerning the strength and speed of the lower limbs.

Keywords: explosive force; physical training; volleyball.

Introduction

In the men world’s nations volleyball ranking, conducted by the International Federation of Volleyball in August 2015, based on the participation in international competitions in the past three years, Romania ranks 69 on a par with Rwanda, Sri Lanka, Seychelles, Botswana, Haiti, Suriname and Uzbekistan, with 9 points. The first 10 positions are held worldwide, as follows: Brazil - 330p, Russia-324p, Poland-285p, Italy, 252p, USA-215p, Serbia-172p, Argentina-170p, Bulgaria-150p, Germany-140p, Cuba-131p. At European level, according to CEV, Romania ranks 27 out of 48 teams on a par with Israel.

Athletic performance is enhanced/limited by many objective factors: somatic, physiological, methodical, psychological, etc. (Nicu, 1993, p. 56; Weineck, 1995, p. 81; Pradet, 2000, p. 102). In Volleyball the somatic signs (height, body mass, body segments proportionality) may favour/limit the performance capacity. Methodological aspects of training are essential if the constitutional type satisfies the specific requirements; these are reflected in the sports training factors.

In our research we found that physical training is one of the most important factors which determine the optimal manifestation of other components of the training. When physical training is below the individual possibilities, the technical and tactical training cannot be fully exploited and from psychically view point doubt, negative thinking, apathy, etc. appears (Smith et. al., 1992). Explosive force of lower limbs is a determinant of specific and integrative physical training in Volleyball (Egger, 1992, p.51; Bompa, 2006, p. 119). The more and more weaker performances obtained by Romanian teams require action in optimizing the specific physical training in favour of technical and tactical training.

Recent studies and researches are emphasizing the relevance of the explosive strength specific training expressed in the volleyball player's efficiency and correlate the output from the attack and service actions with the level of the muscular power of the lower limbs (Cojocaru &Cojocaru, 2012; Lică &Cosma, 2012; Graur &Făgăraș, 2013; Mureșan &Bulduș, 2013).

Purpose. The purpose of this research is to objectively identify some somatic and specific force training differences between the top volleyball players of the world and the Romanian team in order to achieve a proper orientation of the specific training.

Hypotheses. We considered that we will be able to identify the weaknesses from the physical training of the Romanian team players if we will analyze by comparing with the teams ranked in the top four places in 2012 Olympic Games edition, a somatic index (body height) and two indicators of specific force recorded by the values of the ball height strike with one hand from above (F1- attack strike) and two-handed above (F2 - blockage).
Materials and methods

We identified the main features of the Russian, Brazil, Italy and Bulgaria team components, by accessing the websites of the International Federation of Volleyball: body height (BH), body weight (BW) the values recorded at the ball height strikes with one hand from above (F1-strike attack) and with two hands from above (2-blockage). We considered that if we will analyze the linear correlations between BH, F1 and F2 we will highlight the differences in the team. To observe the differences at the game positions level we determined the level of these parameters on the five positions that are specific to the volleyball game.

Results

Table 1. The body height index characteristics -BH

<table>
<thead>
<tr>
<th>Teams/position</th>
<th>Russia (m)</th>
<th>Brazil (m)</th>
<th>Italia (m)</th>
<th>Bulgaria (m)</th>
<th>Romania (m)</th>
<th>Body height average on team positions Romania (m)</th>
<th>Body height average on team positions at top teams (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Libero</td>
<td>1,88</td>
<td>1,84</td>
<td>1,83</td>
<td>1,85</td>
<td>1,90</td>
<td>1,90</td>
<td>1,85</td>
</tr>
<tr>
<td>Coordinator</td>
<td>1,95</td>
<td>1,90</td>
<td>1,94</td>
<td>2,02</td>
<td>1,92</td>
<td>1,95</td>
<td>1,95</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>1,91</td>
<td>2,00</td>
<td>1,96</td>
<td>1,97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second</td>
<td>1,96</td>
<td>2,01</td>
<td>-</td>
<td>1,92</td>
<td>-</td>
<td>1,92</td>
<td>1,97</td>
</tr>
<tr>
<td></td>
<td>2,02</td>
<td>1,94</td>
<td>2,02</td>
<td>-</td>
<td>1,96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Universal</td>
<td>2,18</td>
<td>2,12</td>
<td>2,04</td>
<td>2,06</td>
<td>2,00</td>
<td>2,00</td>
<td>2,05</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>2,03</td>
<td>-</td>
<td>2,04</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principal</td>
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<td>-</td>
<td>2,06</td>
<td>1,96</td>
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<td>-</td>
<td>-</td>
<td>2,08</td>
<td>-</td>
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</tr>
<tr>
<td>Team body height average</td>
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<td>1,96</td>
<td>2,00</td>
<td>1,97</td>
<td>1,97</td>
<td>1,99</td>
</tr>
<tr>
<td>S</td>
<td>±8,2cm</td>
<td>±8,6cm</td>
<td>±7,2cm</td>
<td>±6,5cm</td>
<td>±7,3cm</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

From Table 1 it may be noted that the body height average varies by player's position playing. It follows that the libero is the shortest player (1,83-1,90 m) and the principals are the highest, (1,96-2,18m). In second place in terms of body height, comes the universals then the seconds. Coordinators have a body height average of 1,95m, varying between 1,90 - 2,02m. We found that there are no significant differences regarding the average value of this indicator between the analyzed teams and the Romanian team.

As teams, Russia has the highest body height average (2,03m) with players having values between 1,88 - 2,18m. Even if the body height is an essential element in the selection of volleyball players, it is not always a mandatory criterion in obtaining performance. For example, Brazil (with body heights not very tall) is still number one in the world of Volleyball elite. The following table shows the values recorded by the height of the ball strike with one hand from above F1- attack strike, at the individual level, on positions and globally level on teams. We can see that, on this indicator, from all teams, the Bulgaria stands well with the best homogeneity of the players. The same country has the best individual values at the universal and principal positions.

At this indicator that is appropriate to the specific training, the Romanian team has the lowest values as team and on single positions. Thereby, at team level, Romania has a deficit of 18 cm to Bulgaria, 15,5cm to Russia, 13,9 cm to Italy and 9,1 cm to Brazil. We found large differences on all positions between the average of the four teams and our team, the most obvious being the second's one, 18 cm at libero and 16,8 cm for the coordinator position. The second and principal positions have the smallest negative differences (i.e. 8 and 7,8cm).
Table 2. The specific force index characteristics $F_1$ - attack strike

<table>
<thead>
<tr>
<th>Teams/position</th>
<th>Russia (m)</th>
<th>Brazil (m)</th>
<th>Italia (m)</th>
<th>Bulgaria (m)</th>
<th>Romania (m)</th>
<th>Team average $F_1$ on positions Romania (cm)</th>
<th>Team average $F_1$ on positions at top teams (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Libero</td>
<td>353</td>
<td>323</td>
<td>368</td>
<td>340</td>
<td>330</td>
<td>330.0</td>
<td>346.8</td>
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<td>348</td>
<td>325</td>
<td>330.0</td>
<td>346.0</td>
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<td>Second</td>
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<td>325</td>
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</tr>
<tr>
<td>Team average at $F_1$</td>
<td>345.3</td>
<td>339.7</td>
<td>343.7</td>
<td>347.8</td>
<td>329.8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>S</td>
<td>±15.52</td>
<td>±13.25</td>
<td>±15.63</td>
<td>±12.72</td>
<td>±13.83</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 3. The specific force index characteristics $F_2$ - Block

<table>
<thead>
<tr>
<th>Teams/position</th>
<th>Russia (m)</th>
<th>Brazil (m)</th>
<th>Italia (m)</th>
<th>Bulgaria (m)</th>
<th>Romania (m)</th>
<th>Team average $F_2$ on positions Romania (cm)</th>
<th>Team average $F_2$ on positions at top teams (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Libero</td>
<td>344</td>
<td>302</td>
<td>336</td>
<td>3,25</td>
<td>3,18</td>
<td>318.0</td>
<td>328.4</td>
</tr>
<tr>
<td>Coordinator</td>
<td>339</td>
<td>318</td>
<td>310</td>
<td>3,30</td>
<td>2,95</td>
<td>307.5</td>
<td>324.8</td>
</tr>
<tr>
<td>Second</td>
<td>338</td>
<td>312</td>
<td>315</td>
<td>3,25</td>
<td>3,20</td>
<td>313.7</td>
<td>326.1</td>
</tr>
<tr>
<td>Universal</td>
<td>347</td>
<td>328</td>
<td>316</td>
<td>3,40</td>
<td>2,90</td>
<td>317.6</td>
<td>325.5</td>
</tr>
<tr>
<td>Principal</td>
<td>330</td>
<td>321</td>
<td>310</td>
<td>3,35</td>
<td>3,30</td>
<td>322.5</td>
<td>327.8</td>
</tr>
<tr>
<td>Team average $F_2$</td>
<td>330.7</td>
<td>319.1</td>
<td>324.3</td>
<td>332.2</td>
<td>315.5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>S</td>
<td>±12.1</td>
<td>±11.2</td>
<td>±16.5</td>
<td>±12.0</td>
<td>±17.23</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 3 shows the recorded values of the second parameter of explosive force of the lower limbs, the height of the ball strike with two hands from above, $F_2$ - blockage. It was found that in the case of this indicator too, the Italian team recorded the best performance (i.e. 332.2 cm) from which our team has an average deficit of 16.7cm across all team positions. Brazil has the best homogeneity in this parameter with a standard deviation of ± 11.2, compared with the lack of homogeneity observed in our team (i.e. ± 17.23). Like the values of the $F_1$ parameter, we can observe that the values of the $F_2$ parameter for the Romanian team players, are below the average values of the other four teams, for all playing positions. The biggest difference is emphasized at the coordinator position where Romania has a deficit of 17.3cm.

Next, we determined the correlation between the body height, a somatic parameter that is important in the performance equation in male volleyball and the values of the $F_1$ and $F_2$ parameters, at teams level. Analyzing Table 4 we can see that high positive correlations are recorded for all teams at a significance level of < 0.01, which entitles us to say that the greater specific strength parameter value is, the more efficient the teams will play.
Table 4. Pearson correlation - Body Height T, F₁ and F₂

<table>
<thead>
<tr>
<th>Teams</th>
<th>Pearson Correlation T/F₁</th>
<th>P</th>
<th>Pearson Correlation T/F₂</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>0.851</td>
<td>P&lt; 0.01</td>
<td>0.886</td>
<td>P&lt; 0.01</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.795</td>
<td>P&lt; 0.01</td>
<td>0.862</td>
<td>P&lt; 0.01</td>
</tr>
<tr>
<td>Italy</td>
<td>0.754</td>
<td>P&lt; 0.01</td>
<td>0.852</td>
<td>P&lt; 0.01</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>0.775</td>
<td>P&lt; 0.01</td>
<td>0.822</td>
<td>P&lt; 0.01</td>
</tr>
<tr>
<td>Romania</td>
<td>0.841</td>
<td>P&lt; 0.01</td>
<td>0.795</td>
<td>P&lt; 0.01</td>
</tr>
</tbody>
</table>

Discussions and conclusions

The Romanian team recorded a body height average of 1.96m (± 7.33cm), the height of Romanian players being between 1.90-2.15 m. Lower limbs explosive strength of Romanian volleyball players, recorded at vertically jump to achieve a fixed point with one hand had an average of 329.33 m (± 13.83cm) being comprised between 300-345cm. Regarding the vertical jump in order to reach a fixed point with two hands (blockage jump), the team recorded a value of 315 m (± 17.23cm), the height of jumps ranging between 290-345cm.

Analyzing the data of the top teams and those of Romania, it is noted that although anthropometric indexes are quite close to those of Italy and Brazil, the results achieved in the two jumps (attack strike and blockage) are significantly lower than the others teams. Even if the body height of the players in Romania is approximately the same values compared with the one of the players from the countries included in the survey, the results of the two control tests aimed at lower limbs explosive force are indicating clear differences, the national team players registering underperformance in these tests.

Pearson correlation indices highlight the relationship between the scores obtained at two assessment tests of explosive strength of the lower limbs examined with the body height of the volleyball players. It follows that our players are deficient in terms of specific physical training, specific strength training, this aspect being a limiting factor of performance in the two phases of the game, offense and defence. The improvement of the motor skills level offers an efficient technical performance, its reliability being limited by an insufficient physical training. The research results confirm the work hypothesis according to which we considered that we will identify the weaknesses in the physical training of the Romanian team players if we will analyze (by comparing with the teams ranked in the top four places in 2012Olympic Games edition) a somatic index, the body height and two indicators of specific strength measured by the height values recorded in striking the ball with one hand from above (F₁-attack strike) and two-handed from top (F₂-blockage).

Dynamic evolution of the Volleyball game sports performance requires identifying the development trends of the components that generate progress and those that limit it in order to maximize these performances. The research opens new research perspectives regarding the training methodology which overcomes the shortcomings identified in Romanian team, from the perspective of the explosive strength training indicators. The theoretical model could be expressed, according to research results, as an average of the results of the four world top teams F₁ 344,1cm and F₂ 326,5cm, but also on team positions, as: libero 346.8 / 328,4cm; 346.0 coordinator / 324,8cm; second 341.7 / 326,1cm; universal 345.2 / 325,5cm; 341.8 principal / 327,8cm.

References


FUNCTIONAL REHABILITATION OF THE KNEE JOINT AFTER ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION TO THE FOOTBALL PLAYERS.THE PREOPERATOR STAGE

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Abstract. The objective of this study is to present the latest methods and techniques of functional recovery, the progress of the knee joint in a group of 37 football players who experienced acute rupture of the anterior cruciate ligament (ACL) and to surgical intervention, arthroscopy, reconstruction of neoligament. This paper is a prospective study conducted over a period of 6 years interval according March 2008 - May 2015 and refers to a batch of 37 athletes, football players from Romanian Football League, first league (12), league II (14) and league III (11) who suffered acute trauma of the knee led to complete rupture of the anterior cruciate ligament (ACL). The study was carried out in the weight room of the Football Club Steaua Bucharest (FCSB) and on the soccer field of the club. Patient age limits were in the range of 18-35. Right knee was affected in 23 (62%) patients and left knee in 14 (38%) patients. The recovery program comprised three phases: pre-operative recovery, stage two recovery in the GYM and the third stage, recovering in the football field. In this article we will refer to the first stage of the recovery, held in hall therapy, physiotherapy exercises conducted targets for recovery and functional parameters of the knee joint. Assessing the development and progression of the recovery process at this stage was done by testing, self-assessment functional by the IKDC score subjective and objective tests comparative with knee healthy (test measurement thigh circumference at suprapatelar and test isokinetic). Prescribing progressively graded exercise therapy, preoperative and postoperative both in relation to the time elapsed since surgery, it is essential to protect the graft, and finally return to the performance the athlete in a state as close as the one previous to injury.

Keywords: Knee, ACL, Arthroscopic Reconstruction, Preoperativ Rehabilitation

Introduction

Anterior Cruciate Ligament (ACL) injuries are very common in people participating in sports even more for those participating inactivities that contain pivoting and jumping movements as soccer. ACL tear in sport is quite frequent and it seriously affect players’ career with short-term and long-term consequences. It has also been seen that ACL injuries are very invalidating events that require surgical treatments and keeps majority of football players out of competition at least five, six months. The reconstruction after an anterior cruciate ligament tear (ACL) is one of the most common procedures among orthopedic surgeons around the globe. Today it is generally believed that muscleless strength, neuromuscular control and fear of re-injury are critical factors for a successful return to sports must be considered as imperative in the rehabilitation program included preoperative stage for a successful return to play and the way we assess their improvement during this process is critical.

Prehabilitation has been defined as “the process of enhancing functional capacity of the individual to enable them to withstand the stressor of inactivity preparing a patient before a stressful event” (Ditmyer et al., 2002). Noyes et al., 1983, were the first to propose the use of physiotherapy prior to ACL surgery to increase muscle strength and improve recovery rates. However, to date, very few studies examined the effects of preoperative physiotherapy in this condition (Shaarani et al., 2012). With the advent of MRI technology and improvement in arthroscopic surgical techniques, ACL injuries are identified and managed in a more timely manner. This may be important as to suggest that ACLR is a vital decision to undertake within one year after an ACL injury (Kennedy et al., 2010). The advancement of improving the standard for ACL surgical intervention, and their pre- and postoperative management including rehabilitation is still being pursued. This paper discusses the current knowledge of preoperative training or “prehabilitation” in patients awaiting ACL reconstruction.

Material and method

This paper is a prospective study over a period of 6 years, interval according March 2009 - May 2015. In total 57 athletes from different sports branches patients have received treatment by the recovering knee arthroscopic consecutive reconstruction of the anterior cruciate ligament. We selected a total of 37 athletes, football players from Romanian first League (12), second League (14) and third League (11) who suffered acute trauma of the knee led to complete rupture anterior cruciate ligament (ACL). Patient age limits were in the range 18-35 years old, mean 25.5 years old. Right knee was affected in 23 (62%) patients and left knee in 14 (38%) patients. The study was conducted in physical therapy room (GYM) and pool of FC Steaua Bucureşti and at home of patients. All
patients were informed about the need for surgery for reconstruction of a neoligament and were explained in detail what the surgical procedure and protocol for the recovery of function knee operated stages of recovery and duration for the achievement of objectives. Arthroscopic surgery reconstruction of the torn anterior cruciate ligament was performed by an orthopedic surgeon, physician with expertise in arthroscopy and sports traumatology with over 10 years experience.

Preoperative Rehabilitation protocol

Rehabilitation began immediately after the ACL rupture for a number 11 (28%) athletes who experienced pain, swelling knee flexion and extension limitation of movement. In table 1 we present patients who performed preoperative functional recovery of the knee, age, type of tear of the ACL, isolated or associated with torn meniscus cartilage lesion and duration of the recovery program.

Table 1. Patients who performed preoperative functional recovery of the knee, age, type of tear of the ACL, isolated or associated with torn meniscus cartilage lesion and recovery day

<table>
<thead>
<tr>
<th>Patients</th>
<th>Age</th>
<th>ACL isolated rupture</th>
<th>Associated injuries</th>
<th>Time of recovery /day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 O.C.</td>
<td>18</td>
<td>X</td>
<td>Meniscus</td>
<td>14</td>
</tr>
<tr>
<td>2 M.C.</td>
<td>26</td>
<td></td>
<td>X</td>
<td>26</td>
</tr>
<tr>
<td>3 G.A.</td>
<td>25</td>
<td>X</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>4 M.V.</td>
<td>28</td>
<td>X</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>5 A.N.</td>
<td>28</td>
<td>X</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>6 G.S.</td>
<td>24</td>
<td></td>
<td>X</td>
<td>22</td>
</tr>
<tr>
<td>7 M.R.</td>
<td>34</td>
<td>X</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>8 G.B.</td>
<td>35</td>
<td></td>
<td>X</td>
<td>27</td>
</tr>
<tr>
<td>9 A.P.</td>
<td>33</td>
<td></td>
<td>X</td>
<td>26</td>
</tr>
<tr>
<td>10 L.D.</td>
<td>18</td>
<td>X</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>11 M.G.</td>
<td>22</td>
<td></td>
<td>X</td>
<td>20</td>
</tr>
</tbody>
</table>

The objective of our rehabilitation program are presented in table 2.

Table 2. Preoperative rehabilitation objectives

<table>
<thead>
<tr>
<th>Immobilize the knee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced inflammation, swelling and pain,</td>
</tr>
<tr>
<td>Restore normal joint mobility, especially gradual extension and knee flexion</td>
</tr>
<tr>
<td>Restore voluntary muscle activity</td>
</tr>
<tr>
<td>Normalization of gait</td>
</tr>
<tr>
<td>Mentally prepare the patient for surgery</td>
</tr>
</tbody>
</table>

The main goals of a ‘prehabilitative’ program prior to surgery includes: full range of motion equal to the opposite knee, minimal joint swelling, adequate strength and neuromuscular control, and a positive state of mind. All of these factors facilitate optimal post-operative recovery (Spain et al., 2005). It is important to maintain the highest level of strength and function possible in the unaffected leg, as it will be used for comparison to assess the progress of the reconstructed knee, in the later stages of rehabilitation (Kennedy, 2009). In order to achieve the objectives, patients have performed the following protocol (Kennedy, 2009; Peter, 2010, Wilk et al., 2012, De Carlo, 2012):

**Immobilize the knee.** Following the acute injury we used a knee immobilizer and crutches until the patient regained good muscular control of the leg. The patient was encouraged to bear as much weight on the leg as is comfortable.

**Reduced inflammation, swelling and pain.** To reduce swelling and pain, on patients knee injured was applied an ice pack or gel for 20 minutes at every hour, or a compression sleeve filled with ice cold water (fig.1A). Also the
patients received nonsteroidal anti-inflammatory medications which are continued for 7-10 days following the acute injury.

*Restore normal range of motion.* Full extension was obtained by doing the following exercises: sit on a chair and place the heel on the edge of as tool or chair, relexing the thigh muscles, or using passive knee machine for continue passive motion (CPM) Fig.1 D or *Heel Props:* The patient places the heel on a rolled to wel making sure the heel is propped high enough to lift the thigh off the table (fig.1C). Flexion was obtained by doing the following exercises (Fig. 1E,F,G,D): *Passive knee end.* Sit on the edge of a table and let the knee bend under the influence of gravity. *Wallslides* were used to further increase bending (fig.1H). Subsequent stages of preoperative rehabilitation, down heel slides by grasping the leg with both hands and pulling the heel to ward the buttocks (fig. 1G). Isometric squat exercises on a wall at 45 degrees.

![Fig.1. A ice pack, B- Heel prop, C- Prone hangs,D-Continuous Passive Motion(CPM), E- Knee flexion with a ball (start position), F- Knee flexion with a ball and maintain 5-10° in maximum flexion (final position), G- Heel slide, I- Neuromuscular electrical stimulation, J- Isometric squat exercises on a wall at 45 degrees, K- Isometric squat exercises on a wall at 90 degrees, L-Leg press (eccentric/concentric)](image)

*Quadriceps Muscle Activation Exercises*

Neuromuscular electrical stimulation (Fig.1H), Isometric squat exercises on a wall at 90 degrees (Fig.1J), Isometric squat exercises on a wall at 90 degrees (Fig. 1K), and Leg press (eccentric/concentric) (Fig.1L). This exercise can be performed out of the brace when the leg can be held straight without sagging (quadlag). Once the patient have gained strength, straight leg exercises can be performed while seated.

*Mental preparation* for the surgery cannot be understated. We want patients to have a positive outlook for surgery and to prepare to work hard after surgery. Mental preparation therefore includes educating patients about the injury, surgery, and rehabilitation goals. Knee anatomy and ACL function are carefully explained before surgery. Once surgical reconstruction is elected, the rehabilitation goals and their rationale are discussed. A booklet covering the same information is given to patients to review at home. Regaining total knee mobility harmed, equal to the opposite knee, quadriceps muscle strength recovery and femoral biceps, neuromuscular control and a positive state of mind of the patient are factors that positively influence optimal postoperative recovery. It is important to maintain the highest possible level of power and functionality to the unaffected leg, so it can be used as a comparison for assessing progress in the further knee surgery (Peter, 2010).
Results

Preoperative phase took place gradually over a longer period of time between 14 and 27 days depending on how the knee responds to the initial injury. The IKDC (International Knee Documentation Committee) subjective survey was used to evaluate pain, activity, and knee function. Patients were asked to complete the questionnaire independently before and in the end of preoperative rehabilitation. Range of motion measurements were recorded as A, B, C, with A being the degrees of hyperextension, B indicating lack of extension from zero, and C documenting the degrees of flexion. Quadriceps muscle strength was evaluated with isokinetic strength testing performed at 180°/sec. The IKDC objective form grades range of motion as normal, nearly normal, abnormal, or severely abnormal. Range of motion was graded according to IKDC criteria.

Discussions

Prehabilitation is defined as “a proactive, preventive approach to exercise, diet and lifestyle changes, designed to maximise health and wellness”. The concept was initially coined in the 1980s for professional athletes as a process to prevent unnecessary atrophy of muscle in order to prevent future injuries (Spain et al., 2005). Before proceeding with surgery, the acutely injured knee should be in a quiescent state with little or no swelling, have a full range of motion, and the patient should have a normal or near normal gait pattern. More important than a predetermined time before performing surgery is the condition of the knee at the time of surgery. In our study preoperative recovery program was customized in relation to clinical symptoms, intensity and persistence of pain and the data objective examination of the degree of swelling of the knee and impaired joint mobility, extension flexion, gait and subjective and objective test results. Table 1 shows the recovery intervals before preoperative surgery. At the 5 patients with isolated rupture of the ACL restore, full range of motion, and a normal gait pattern duration of the preoperative recovery it was between 14 and 19 days. In patients with associated injuries, meniscus and cartilage recovery interval was longer, between 20 and 27 days. The results demonstrate the effectiveness of rehabilitation before ACL reconstruction. This particular study shows that knee pain and function can significantly improve by increasing knee range of motion and, in particular, knee extension. The rehabilitation of patients undergoing anterior cruciate ligament (ACL) reconstruction requires symmetry in bilateral quadriceps strength and adequate proprioception capabilities prior to return to preoperative level of activity or sport. This is the limiting factor and can delay the time that patients can return to play. Proprioception exercises was initiated immediately after injury, as it is known that proprioceptive input and neuromuscular control are altered after ACL injury (Kennedy, 2009). By challenging the proprioceptive system though specific exercises, other knee joint mechanoreceptors are activated that produce compensatory muscle activation patterns in the neuromuscular system that may assist with joint stability. Preoperative quadriceps strength is an important predictor of the functional outcome of the knee joint after ACLR (Eitzen et al., 2009). Studies that have assessed strength deficits in the quadriceps and hamstring muscles before and after reconstructive surgery harvesting the ACL graft suggest a role for ACL prehabilitation before ACLR (Keays, 2002). The psychological status of an athlete experiencing an ACL injury is of great importance in order to manage a successful return to his preinjury level. Ardernetal. (2011) reported that individuals who manage to go back to their preinjury level sport had a much lower fear of reinjury compared to those who did not manage to go back to this level.

Conclusion

There has been a significant improvement in the management of ACL injuries since Noyes et al. proposed the usage of strength training ACL-injured patients. Rehabilitation before surgery has always been an integral component to the success of patients’ recovery to normal activities. The role of prehabilitation as a pre-operative intervention complementary to current practices is currently emerging; however, further research into preoperative resistance training in combination with proprioceptive training is required to significantly improve this arsenal of management strategies available to patients. In our study, of the entire group of 37 athletes preoperative rehabilitation program was applied to 11 (28%) athletes and spanned a period of 27 days. At the 5 patients with isolated rupture of the ACL restore, full range of motion, and a normal gait pattern duration of the preoperative recovery it was between 14 and 19 days. In patients with associated injuries, meniscus and cartilage recovery interval was longer, between 20 and 27 days. The results demonstrate the effectiveness of rehabilitation before ACL reconstruction.
References


SOCIAL IMPACT BY ORGANIZING SPORTS EVENTS

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Abstract. This paper deals with a very important current topic. Current, due to the active Romanian participation in the work of the experts groups set up by the European Union and the implementation of their recommendations. Important, as the topic is reflected in the legal framework regulating our field. Although sport is one of the most complex activities, due to the objective and subjective, biological, psychological, economic, cultural, managerial, etc. spheres of interest it drives, given its specificity as a process and phenomenon, its management raises complex issues from design to evaluation. The main goal of our work is to highlight the level of harmonization of our specific activity with the European Union recommendations and guidelines for sport. The main research method was critical review of Romanian sport legislation and European Union official documents. The purpose of the research was to identify the social impact of sports events organization in Romania, according to the European Commission's recommendations.

Keywords: sport, social, impact.

Introduction

The controversial and problematic topic raised by the use of EU funds after accession addressed to sport and European public policy leads us to an analysis of the historical, theoretical and practical development in the context of sport's international. „Sport is part of the heritage of every man and every woman, and its absence can never be compensated” - Pierre de Coubertin.

In our industry, education and health through and in sport in reference to the importance of the activity, the sport movement in the social, health, education, creating jobs, sports infrastructure, information and any communication until 2012, didn’t exist an action plan in accordance with the recommendations of the European Commission. On December 16, 2010, the European Parliament by a majority of 385 votes, of which 24 were of Romanian MEPs, voted the Declaration 0062/2010 on sport at local level, European Commission document published in the 21/12/2016.

Mogens Kirkeby, president of ISCA, "the support for the Declaration combined with conclusions of the meeting of sports ministers from November 18, emphasizes strongly that mass sport should be the absolute priority of the European Union in sport in the coming years". "A milestone in the political commitment in the field of sport at European level. A very encouraging initiative and political visionary".

The Lisbon Treaty sets out the policy of the European Union. Sport, through its three main functions meets all current requirements of ethics and conduct, prevention and preservation of health, establishing real economical dimension in the life of every individual, the social system in its entirety by reference to the adaptability and performance in the workplace, the spirit of fair play and team spirit, concentration and dedication in front of the objective, health insurance, creating models, commercial and economic, leisure, sport in the forms of nature, sports recreation, eco and bio systems, formal education, competition, and so on.

Sport, through its three main functions; social, educational, cultural, meets all current requirements of ethics and conduct, prevention and preservation of health, social integration and sustainable harmonious development.

The European Commission recognizes that in terms of "responsibility to manage aspects of sport, national sports federations by sport hold a decisive role". And that as "sports organizations must fulfill its important task to organize and promote their particular sports, in compliance with Community legislation. "White Paper on sport, Cap 1".

Materials and methods

In the period 2014-2020, sport will have for the first time, his own capital and budget (Budget of 30 million euro, proposed by EU). European Commission also highlights the huge potential of sport to bring contributions to increasing employability and mobility through actions that promote social inclusion in and through sport, education and training.

Measures imposed on Member States can be found in the following directions: the social role of sport, the size of the economic fundamentals of the sport (collection of comparable data, financial support of sports organizations and mass organization of sport (specificity, freedom of movement, protection of minors, corruption, money
laundering, match-fixing, transfers of players, systems of licensing and media rights, Pierre de Coubertin Action Plan which addresses the social and economic aspects of sport and public health, education, social inclusion and volunteering, external relations and financing.

Action plan of measures financed by the European Commission.

Develop the extended program of activities in order to strengthen the health of citizens, regardless of age and sex (Education through Sport), the fight against doping; Enhancing the role of sport in education; Promoting volunteering in sport, Social inclusion; Combating racism; Sport as a development tool; Promoting active citizenship through sport; Fight against overweight, obesity, chronic diseases; Removing prejudices, social integration of people with disabilities (fig. 1).

![Fig. 1. The social impact of the action plan of the European Programme Pierre de Coubertin](image)

We have identified direct and indirect economic effects divided equally in social, health and education sectors (fig. 2), regarding LOC.

![Fig. 2. Impact of LOC](image)

The development of new guidelines on physical activity through cooperation and interaction between the fields of education, health, environment, administration, culture, sport in order to establish a strategy for health through sport, in order to promote active citizenship through national projects with to render the right to health through movement. The social impact is catalyzed by a multitude of factors with respect to the issues mentioned in Fig. 3 and 4.
The increased role of sport in education and training through the value that sport demonstrates in general, help develop motivation, tenacity, understanding your own body, brain oxygenation by pulse 100 beats per minute, the training effort individual and professional mobility.

To promote sports activities in the school environment, volunteering and active citizenship through sport, respect for the rules of the game, fair play, respect, solidarity, discipline, organizing competitions locally, regionally or nationally and the international register, but also other competitions, cups, memorials, events, actions prevention in the direction of the fight against delinquency in the amateur system.

One of the most important roles is to create models sport among young people, to form new performers, specialists in the field, by promoting sports competition and attracting new practitioners (fig. 5).
The increased role of sport in education and training through the value that sport demonstrates in general, help develop motivation, tenacity, understanding your own body, brain oxygenation by pulse 100 beats per minute, the training effort individual and professional mobility.

To promote volunteering and active citizenship through sport, respect for the rules of the game, fair play, respect, solidarity, discipline, organizing competitions locally, regional or national and the international register, but also other competitions, cups, memorials, events, actions prevention in the direction of the fight against delinquency in the amateur system.

Another social effect of the events organizing sports is to develop and correlate indirectly the activities of several sectors, such as tourism, health, social dialogue and contribute to society through infrastructure development (fig. 6).

**Results**

Overall satisfaction with sport event high in the city/cities, country/countries. Perception of Host City - Perception of the host cities before visiting has to be high and don’t change greatly as a result of the visit.

Areas for improvement. In order to overall improve future events and encourage more fans to attend the next tournament, we should focus on improving the information we provide to fans on the tournament, the activities offered in host cities and ticketing.
Broadcasting the values of sport to the entire world – international sport competitions are activities of public diplomacy, through the functions of sport: promoting education, health, intercultural dialogue, peace and competition.

Sport has been an engine for interactive communication, interactive television services, free access for citizens to sport events broadcast with respecting the principles of competition for the sale of broadcast rights.

Goals: To improve public health through physical activity, fight against overweight, obesity, chronic diseases such as cardiovascular diseases and diabetes. We know well from personal experience that the health affects quality of life which indirectly creates problems with health budgets and the economy, The World Health Organization, WHO recognizes that the sports movement improves health and recommends “at least 30 minutes of physical activities that require moderate exercise per day for adults and 60 minutes for children” – WHO. The development of new guidelines on physical activity through cooperation and interaction between the fields of education, health, environment, administration, culture, sport, in order to establish a strategy for health through sport, in order to promote active citizenship through national projects with to render the right to health through movement. To identify the problems that the non-profit associations are confronted with, as well as the services ensured by these organizations and their preocupations regarding beginner level sport.

Adapting the sport infrastructure to the purpose of facilitating access to special needs persons as well as the training of overseers and trainers in the field, of volunteers and welcome personnel.

Abolishing racism, xenophobia, stadium violence, legislative reform in all member states through prevention actions, but also penalties for incidents, actions through dialogue and well mannered practices in the field. In this regard, federations must have procedures for their affiliate sports structures. The important component is the human resource, ensuring lectors, stimulents and motivations for the working personnel in the field, ensuring transparency and informing the implicated actors through the allocation of a procent of the budget to promoting actions.

Creating role models we are on the way of the European Commission: improving health through physical activity (with aspects of lifestyle, youth and citizenship programs continue learned and training of teachers, trainers, coaches) and retraining athletes performance models in society, in order to ensure their social protection through projects like “dual career”.

As in any business plan the feedback of the consumers of sporting events it is most relevant in terms of goals, to organize major competitions, as well as in promoting the city and the organizing country. Presented below are 2 types of pools usually in social impact analysis of the events organizing sports (table 1 and 2).

Table 1. How likely are the fans to attend the event

<table>
<thead>
<tr>
<th>Feedback</th>
<th>Unlikely</th>
<th>Quite likely</th>
<th>Likely</th>
<th>Very likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informations about the event</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of sport in the field</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ticketing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilette facilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Different services</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Overview of respondents: Respondent Age, Gender, countries, cities

Table 2. Perception, opinion of the city by respondents before visiting and after visiting

<table>
<thead>
<tr>
<th>Perceptions</th>
<th>Before the event</th>
<th>After the event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quite Positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neither</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quite negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion and conclusion

The objectives of the Action Plan of The European Comission and economic dimension of sport with regard to the social function and financial increase by organising major sports events. Social integration and inclusion through sport, to end discrimination through sport, equal chances, referring to the economic and social cohesion, to the utilization of sports potential, for persons with special needs, for minorities, for unfavored categories, integration of immigrants into society through strictly respecting sport rules, integration into the cultural group, with respecting tradition and the aims of the organization that they are part of. “Sport promotes the sentiment of belonging to a group and maybe, in this sense, it represents an important tool for the integration of immigrants” (The white book of sports. Chapter 2. Art. 2.5).

During a major event we can improve the European Commission program for promoting health through physical activity (with aspects of lifestyle, youth and citizenship programs, continuous learning and training of teachers, trainers, coaches) and retraining athletes performance models in society, in order to ensure their social protection through projects like "dual career", or fight against doping with programs and recognition and implementation of programs WADA (World Anti-Doping Agency), INTERPOL (with a role in providing the fuses and exchange of information) in the fight against this scourge extremely dangerous, a threat to sport, a factor deterrent in sporting competition, whose spirit of fair play is recognized.

The founding of special national programs financed by public income, alcohol excise, tobacco. All of this with the goal in mind, of raising the level of employment of national sports federations, of elaborating territorial procedures, towards achieving the projects, the financing, through the county departments for youth and sport, and the creation of a national evaluation system, of monitorization and control. We must not overlook the human resource, the most important national resource, and we are referring to the training of personnel involved in the projects, the creation of an informatic system for promoting the plan in action, and the growth of the number of financed projects.

Thematical discussions and social dialogue – District committee for social dialogue in the sports sector.

The continuation of the research and analysis process in the field of sports management and the coherent identification of sports goals, specific to the domain of activity and the consistency of management in the field, while based on a scientific concept that should identify all relevant sectors of the development process of sports branches, through national means, sports federations and to recover the gaps of development in rapport to history, and the international development in this field.

References

The White Book of Sports. Chapter 2. Art. 2.5
The White Book of Sports. Chapter 1
THE FUTURE OF SPORT LAW IN ROMANIA

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Abstract. The current society has led to a comprehensive approach to sport, its multi role imposing a vision in a close relationship with the notion of law. These two concepts coexist, harmoniously intertwine, giving rise to a branch of law which, for the moment, doesn’t exist in Romania: SPORT LAW. Regulating the relations between the sport’s movement stakeholders (athletes, coaches, trainers, sports clubs, national and international sport federations), and between them and external factors, cannot be undertaken without a correct knowledge of the rights and obligations of each involved party. Often, the athletes do not benefit from all rights in their sport activity, so they are vulnerable and in a lesser position as opposed to the obligations imposed by the Contracting party. In Romania sport law is a reality, with particularly large impact on all possible involved parties, and its implementation has become an obvious necessity: sport law must become a part of the Romanian juridical system. The effects of the implementation of this branch of law are long-term beneficial to the entire nation.

Keywords: sport; law; juridical system; legal status.

Introduction

What is the legal status of an athlete? What rules apply to the sports phenomenon: the common law or special law? What are the advantages of a contract negotiated, drafted and signed by the athlete in the presence of a lawyer? Who is responsible for sports accidents? What are the rights of athletes?

To answer to all of these questions it is important to understand what SPORT LAW is.

The conceptual approach of sport as a universal phenomenon.

Knowledge of global sports judicial order requires, first of all, the ethymological study of the word "sport". So, it has a long journey, its origin being in the Latin word "deportation", which, among its primary sense, means to get out the gate, to go outside the city walls to devote to sports activities" (Wikipedia, 2016). "Deportare" created other terms such as (Wikipedia, 2016) "deportar", Spanish word "deportar", French word "despoter", that means pleasure, entertainment, delight. This last word created, also, (since approx. 1300), in English "disport" meaning relaxation, entertainment for aristocrats, then turn into "sport" in the sense used in our day, activity involving exercise; the first mention of the term is from 1520 (Online Etymology Dictionaries, 2016).

In 1875, in "Le Grand Dictionnaire Larousse" is certified with the word "sport" which means relaxation, entertainment, exercises.

Outstanding personality of world sport, born visionary, Baron Pierre de Coubertin is one of those who marked the moment that sport goes to another level, the competition: «L'essence du sport c'est l'effort; son condiment indispensable c'est le concours» (de Coubertin, 1902). Socially, sport brings people closer together, unites them by its values, such as competition, team spirit, fair play.

Through organized events (basketball games, handball etc.) it releases the social tension, aggression, violence; sport helps with the integration of all social groups, including those marginalized, creates an evident unity for those outside the phenomenon. Part of continuing education, sport creates authentic values for children and young people. The feeling of national identity through sport is fundamental to any nation.

A legal definition of sport recognized by the European Council is given in Article 2 of the European Charter of Sport (1992, p. 5): "sport" means all forms of physical activity which, through casual or organized participation, aim at expressing or improving physical fitness and mental well-being, forming social relationships or obtaining results in competition at all levels.

From general judicial order to sports judicial order

Jean-Lois Halperin shows in his "L'apparition et la portée de la notion d'ordre juridique dans la doctrine internationaliste du XIXe siècle" (2001, p.6) that the term "judicial order" is relatively new, being used for the first time in Germany, during XIX century.

In Italy, Anzilotti is one of the first authors that used the concept of "judicial order" in 1898. Later, Santi Romano (1875-1947), professor of law at the University of Pisa, in 1918 published the first edition of "Ordinamento Giuridico" reference work in the legal system.
Professor Santi Romano shows that the term "law" and "juridical order" are not synonyms. While "law" in an objective sense, is the legal rules or set of rules, Italian jurist Santi Romano understands "legal order" in a double sense: on one hand, the idea of "rule" and "norm" and on the other hand, "every legal order is an institution and vice versa every institution is a legal order (...)" (Romano, 1945, p.7). Legal rule and institution are the two elements subordinate of the concept of "juridical order"; there are so many juridical orders that so many institutions are.

In other words, the concept of "juridical order" represents all legal norms and legal institution, the method of operation of the relations between the multiple sub-systems.

Sports movement has become a wide institution, with multiple effects in society.

Competitive sport came later and now it has a pyramidal structure: the events will be governed by private law rules, the sport clubs function on the basis of this system. Every sport discipline operates within a national sport federation, which is a part of a federal structure for every continent.

International sports federations are unique to each sport. In this regard, Gérald Simon says: "La fédération sportive est un institution. Mais elle est un institution particulière qui, par les modalités de sa formation comme par ses divers attributs emprunte de nombreux traits à l'organisation de la puissance publique" (Gérald, 1990, p. 8).

The rules, the norms are adopted by sports federations under its regulatory power; become binding on its members, who must comply them, otherwise disciplinary penalties are applied.

The above can be expressed in concrete and synthetic form, as follows: "(...) le pouvoir fédéral est à la base d'un ordre juridique à a part entière et distinct de celui des États: l'ordre juridique sportif" (Simon, Chaussard and Icard, 2012).

All sports are closely related to each other, they are integrated, thus providing a consistency, uniformity to entire sports system.

The theory of "juridical order", developed and supported by the Italian jurist Santi Romano, is applied in the same manner to the sport phenomenon, so there is "sport juridical order".

Otherwise, Professor Gérald Simon (1990, p. 11) states that "sports world is a world of law in the center of which dominates the rule" (Gérald, 1990, p. 12); it is "an independent juridical order (...) which can only exist if federal institutions – and only themselves – focus on their unity and necessary authority for the functioning".

So, the sport law represents all norms, rules of public law and private law, which govern sports phenomenon. The essential feature of this branch of law is that "it is not a unified corpus, rather it acts as a generic term designating rules of diverse origins, who’s common point is sport phenomenon government" (Latty, 2007, p. 14).

It is therefore necessary a brief analysis (Buy et al., 2012) of the sources of sport law.

A first category of laws that governs "sports juridical order" is the private law.

The contract has an important role in the sport phenomenon because it is regulating social, economic relations etc. It must be remembered that a professional athlete is regarded as a worker at EU level, and, as an employee, he must sign an individual employment contract.

If a professional athlete meets the legal requirements to be considered self-employed, the legal status will require the conclusion of another type of contract: the civil convention for sport services.

In this regard, it is very important for sport law, for a right understanding of the legal nature of the incomes earned by professional athletes and, consequently, for signing legal documents suitable for each athlete status, the view of the High Court of Cassation and Justice.

In Decision no. 3318/2011 issued by the Administrative and Fiscal Department they show: "(...) the trial court appropriated unfounded allegations that respondent - applicant challenged the dependent nature of work undertaken by professional athletes, qualifying their work as independent although not proven criteria exist, according to article 18 and article19 of H.G. no. 44/2004, largely define the existence of an independent activity.

Compared to these provisions, it appears that tax inspection authority right held that work done by the soccer player is not made casually and does not meet the legal criteria to be an independent activity.

In this situation, the incomes of the player have been properly restated as income from salary and it is not the result of an activity which involves the participation of athletes in competitions on their own, without a contractual relationship with the entity paying the free choice of activity, the program and place of work.

(...) By amending the physical education and sport law, it was awarded to the professional athlete the opportunity to choose between signing with the sport structure an individual employment contract or a civil agreement, without regulating a different tax regime for revenues and consequently, so they are subject to the rules contained in the General Tax Code, depending on whether dependent or independent of the work done, according to the criteria defined in art. 18 and 19 of HG no. 44/2004 (...) " (2016, p. 16).
There are many countries where the relationship between sports clubs, as employers, and professional athletes, as employees, is regulated by a national collective agreement.

For instance, in France, "La Convention collective nationale du sport du 7 juillet 2005 par arrêté du 21 novembre étendue 2006" addresses the following issues: social dialogue, the freedom of opinion, the representation of employees, the individual employment contract; general principles of health and safety at work; training of employees.

Chapter XII of the national collective agreement deals with professional sports: the nature and the conditions of exercise of this profession, payment, social guarantees, health at work, training and the possibility of subsequent retraining of professional athletes and coaches.

Sports law is also regulated by:

- technical rules, specific to every sport. They fall within the jurisdiction of international sports federations. Although technical rules are designed to standardize every branch of sports, "according to general opinion, they are not rules of law" (Buy & Rizzo, 2009, p. 17).
- organization rules.
- economic and financial rules.
- The Code of Ethics in sports, essential for professional sports and amateur.

Unity, solidarity, fair-play, respect are defining elements for sport in general. Each sport federation draws up such rules to give a natural course (professional, humane, spiritual, moral) to the sport.

In Romania, physical education and sport field are governed by Law no.69 / 2000 on physical education and sport, as well as The Decision no. 884 of 13 September 2001.

An important element is that there is a plurality of sport juridical orders because in this phenomenon are included distinct legal relations.

So, the common law is directly applicable: labor law, civil law governs distinct aspects of existing sports movement, tax law etc.

Also, art. 49 para. 5 of the Constitution provides that "public authorities shall contribute to ensuring conditions for free participation of youth in political, social, economic, cultural and sporting life of the country."

European Union law (treaties, declarations, reports and white papers) is one of the most important sources of sport law. As the sport has shown its importance, article 165 of the Treaty on the Functioning of the European Union establishes a specific EU competence in this field: coordination of policies taken by each Member State and the initiation of new projects in this area.

The case law of the Court of Justice of the European Union has a particularly impact on sport in general, and especially on sport law. Judgment in the Bosman Case is one of the most important decisions of the ECJ because it has revolutionized initially football world, and then the way of how sport litigation are solved; the court's reasoning is based on real argument, relevant, conclusive in concordance with the principles and the provisions of EU law, namely the free movement of workers.

This case marks the point at which the athlete is considered professional worker under EU law.

Pleading for sport and sport law in Romania.

Through sport we can build many things for a nation: health, education, culture, we can give a correct sense of our life, we can acquire values that form us.

We have a moral obligation to help Romanian society to evolve. A coherent, viable, long-term sport system is need in Romania.

From a legal perspective, it is necessary to train specialists who understand the phenomenon and sports policies at national, European and international level.

Sport law, branch of law which does not exist in Romania, it is multidisciplinary; sport phenomenon interacts with labor law and social security law, civil law, administrative law, European Union law. Moreover, "no branch of law is not autonomous and each is integral with the legal system as a whole" (Lyon-Caen, 2004, p. 18).

There are many decisions of the courts in Romania which shows the interpretation of these special rules (eg. Law no.69/2000 on physical education and sport, as amended and supplemented, in conjunction with the provisions of the Tax Code).
It requires the implementation of this branch of law in Romania in law schools, sport university to prepare many specialists that form subsequently a vision of the sport system. On the other hand, many professional and amateur athletes do not know their rights.

In Romania, the Law no.69 / 2000 on physical education and sports requires an update. Physical education and sport require also a multidisciplinary approach. Two conditions are necessary for this purpose:
- on the one hand, we need the expertise of highly trained people in the field;
- of the other hand, requires a basic traits of those involved in change: patriotism, a desire to do good for other members of society.

The spirit of the team, unity, solidarity, selflessness, lack of ego, negative feelings are what we need now, for change, for the wellbeing of society.

In the end I can only say: Romania needs physical education and sport. Romania needs sport law, which, metaphorically, is the Dojo where "practitioners" (civil law, labor law, EU law), imposing their own law creates a new legal order, the sport juridical order.

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Recommandation nr. R (92) 13 Rev du Comité des Ministres aux États Membres sur la Charte Européenne du Sport-revisée.1992 le 24 septembre: "On entend par "sport" toutes formes d'activités physiques qui, à travers une participation organisée ou non, ont pour objectif l'expression ou l'amélioration de la condition physique et psychique, le développement des relations sociales ou l'obtention de résultats en compétition de tous niveaux".
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